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STYROCELL is a rigid, lightweight material consisting of a profusion of non-communicating air cells encased in polystyrene. By maintaining a fine balance between its weight and the volume of trapped air, STYROCELL provides a barrier of virtually still air—the ideal thermal insulant. In addition to its light weight—1 lb. per cubic foot—STYROCELL is inert, rot-proof and possesses a low water-vapour permeability, good mechanical strength, chemical resistance and electrical properties. Easy to handle and to work, STYROCELL is an inexpensive material that gives new meaning to effective thermal insulation. Available in either standard or self-extinguishing grades—in thicknesses from ½" - 10".

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AIR CURTAIN UNIT

FOR OPEN COLD STORE DOORS

For efficient Cold Storage operation

The Minikay System keeps new insulation permanently dry and dries out existing wet insulation.

The Minikay System eliminates the heavy cost of re-insulation.

The Minikay System extends the life of your cold store to that of normal buildings.

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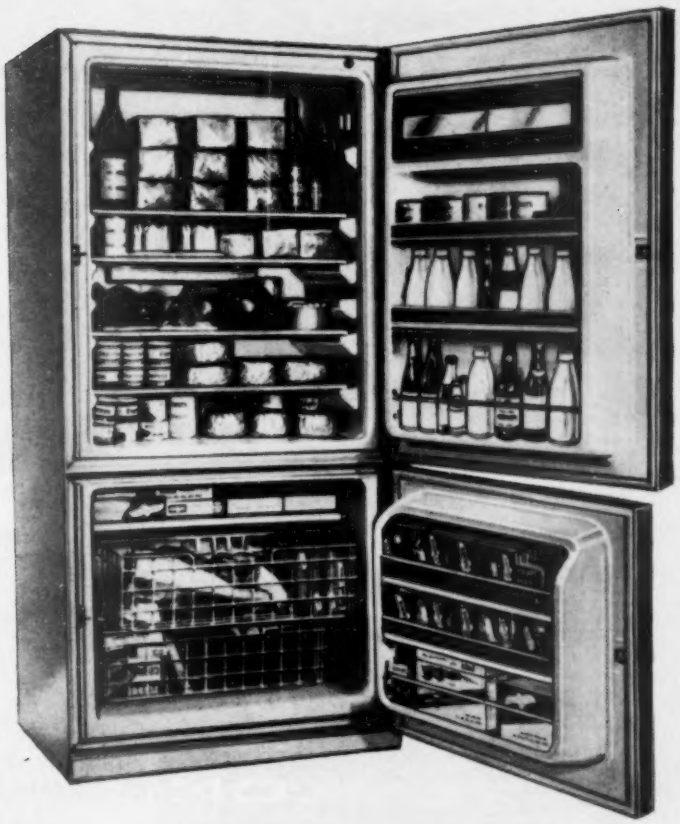

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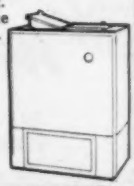
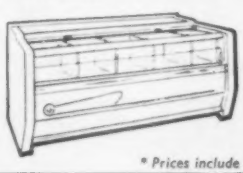
Conservator. Capacity 3 cu. ft. Holds 15 gals. ice cream or 120 lb. frozen food. Price: £74.0.0.*



GS 9I
Super Salesman. Capacity: 11.4 cu. ft. Height: 42⅜". Length: 72". Width: 30". Price: £230.10.0.*



GSD 7I
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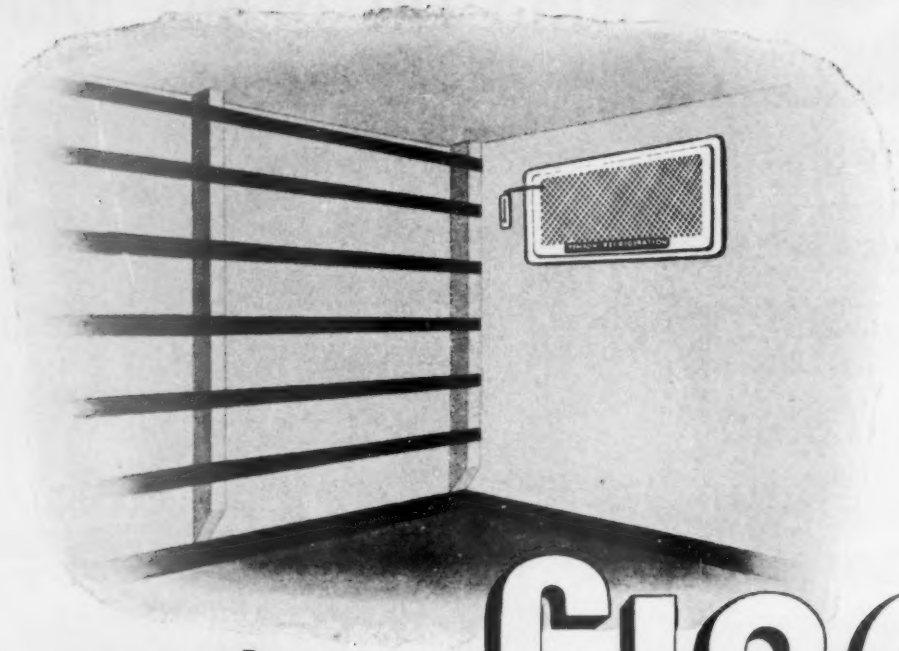

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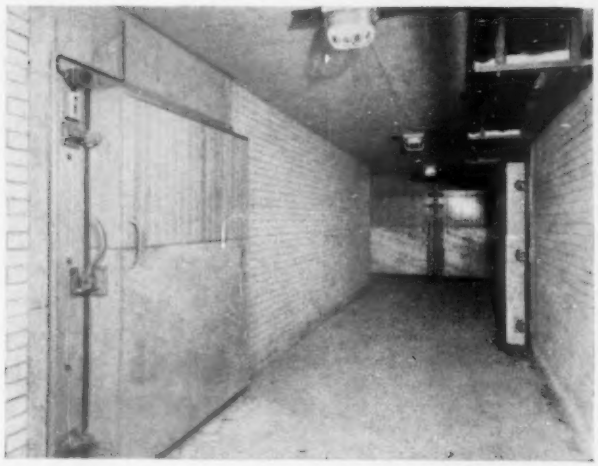

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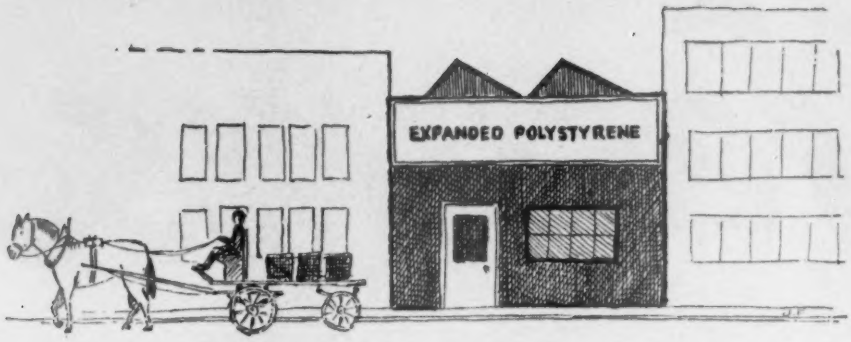

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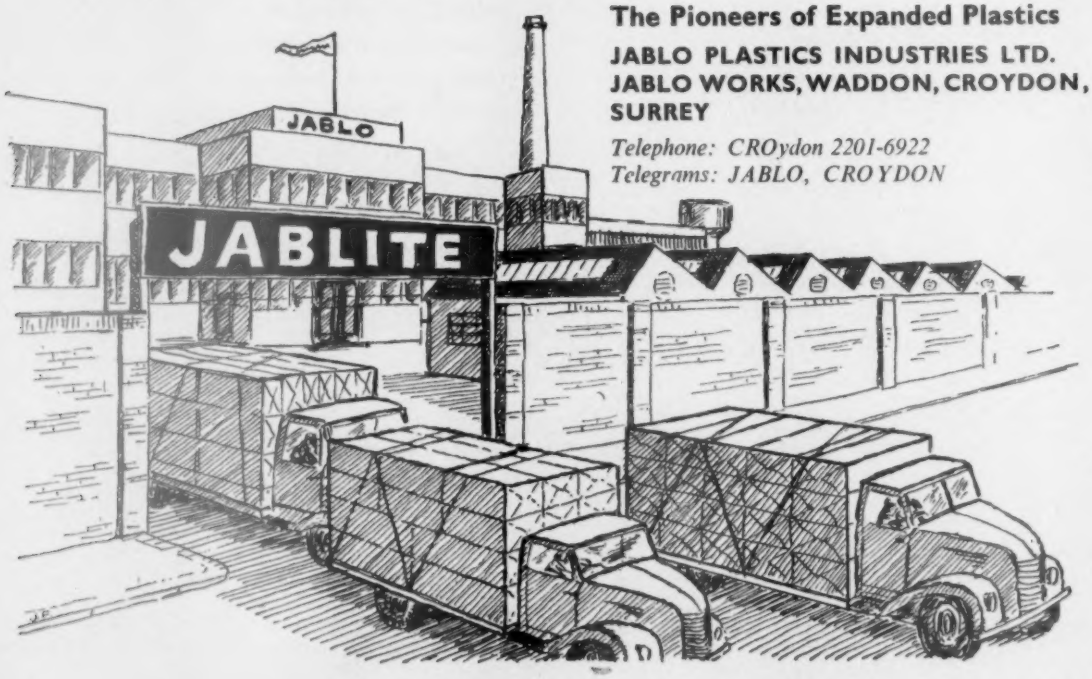

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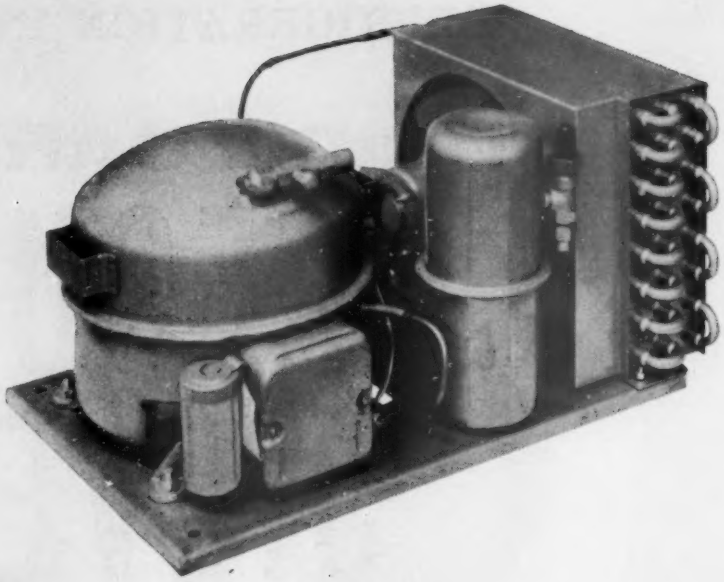

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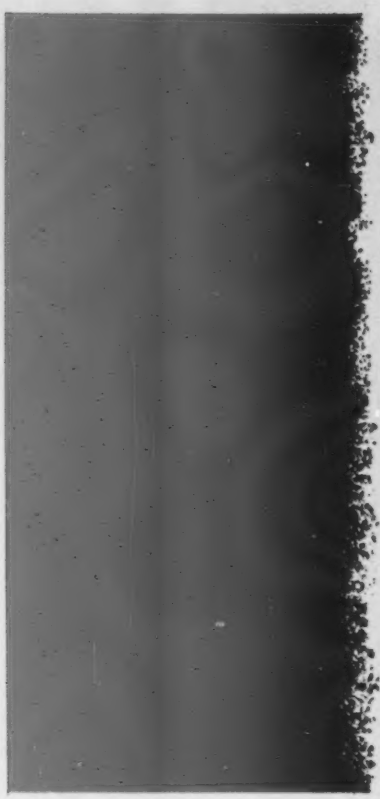

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'THERMOCAL' DF—most anti-corrosive of all glycol based heat-transfer media now employed in industrial refrigeration—is widely used to prevent frost build-up on primary refrigeration coils; it can also be used as the main coolant.

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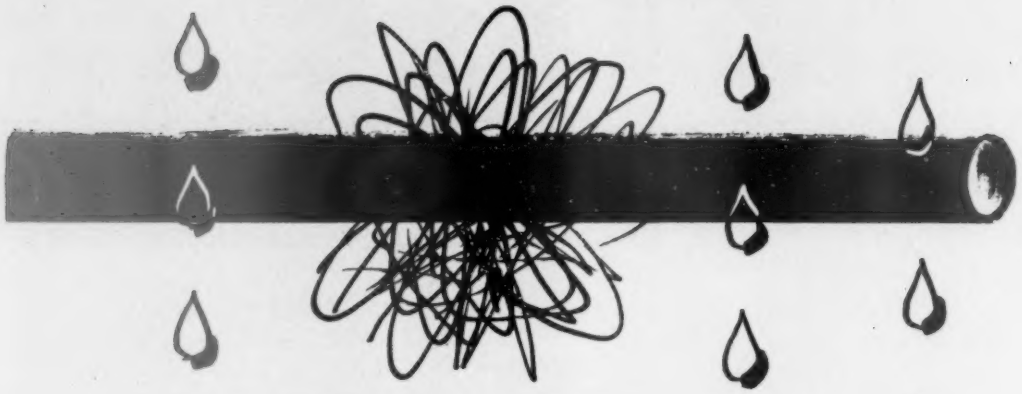

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are cationic surface-active organic chemicals which penetrate scale and corrosion deposits and bring them away from the base metal so that the heat transfer surfaces are left in a clean condition. Treatment is also adsorbed onto organisms such as algae and slime, effectively destroying them. Under treatment, water slime is usually dispersed within twenty-four hours and algae growth killed within ten days; thus improved water flow and increased heat transfer is ensured. Scale, products of corrosion, oily and entrained atmospheric deposits are all removed from the heat transfer surfaces of the cooling plant with a resultant increase in the running efficiency.

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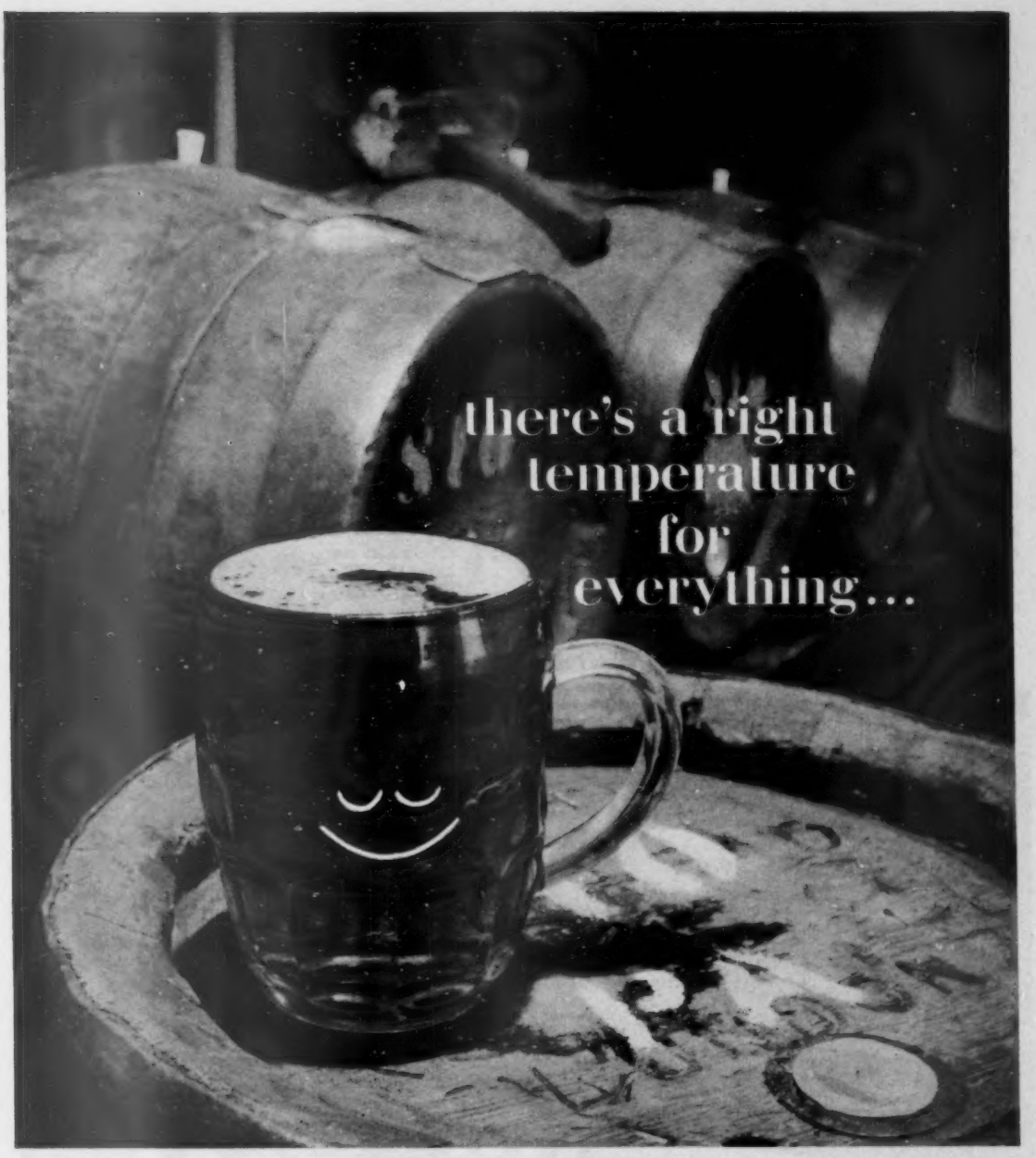

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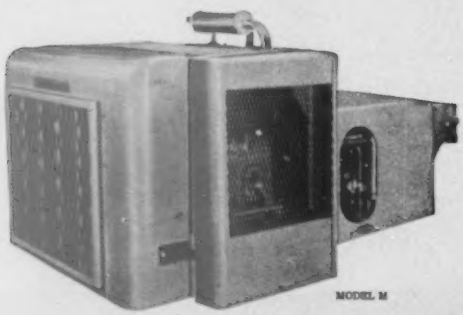

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Increased demand and production in Great Britain of the world-renowned Thermo King refrigeration units have already made possible substantial price reductions. Thermo King units are built with 50% British components, and this percentage will be increased in the near future.

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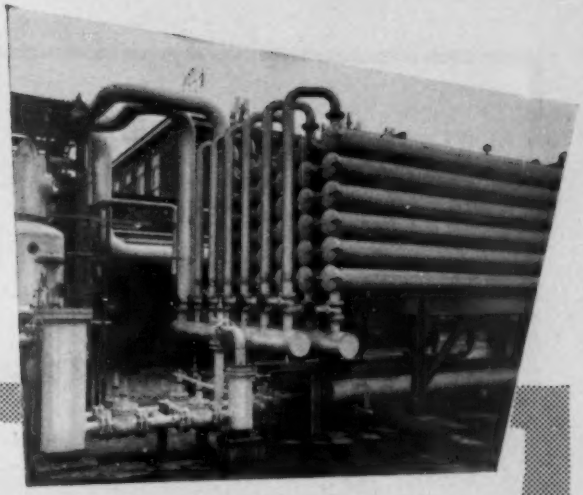

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The plant will provide the plastics and synthetic fibres industries with the vital acrylonitrile monomer.

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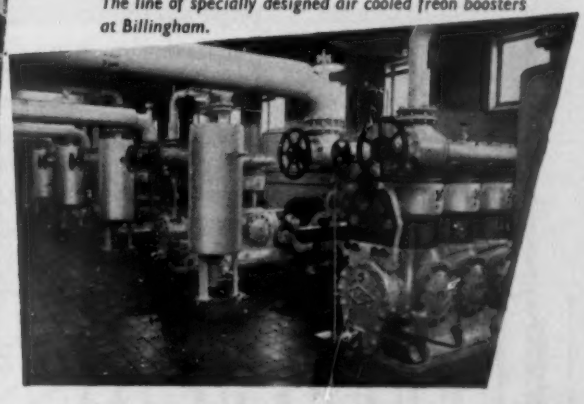
The line of specially designed air cooled freon boosters at Billingham.



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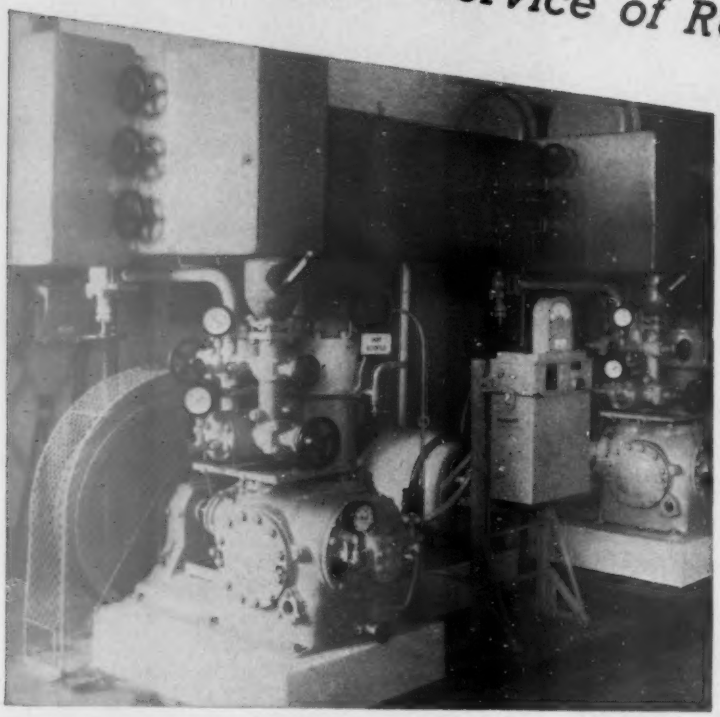

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for all Cold Storage and low temperature work

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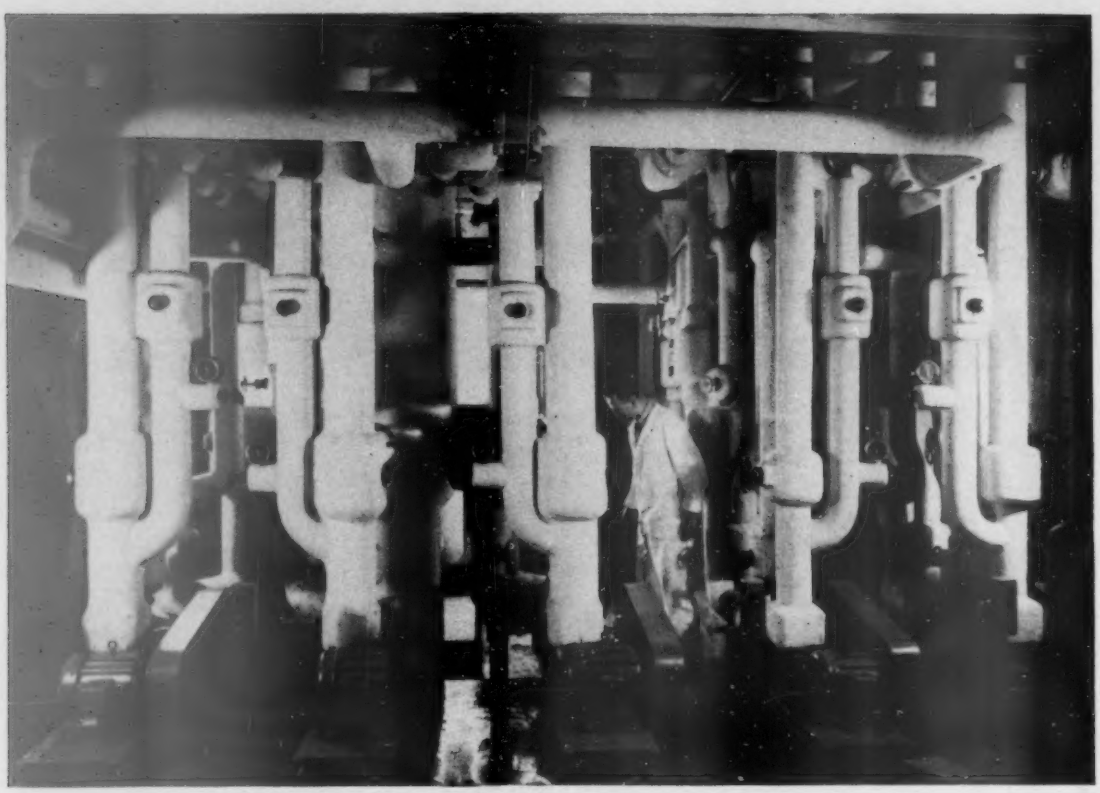

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helps to make Lyons Maid *ice cream*

In this extremely advanced and well-equipped plant at Bridge Park, Greenford, Onazote pipe sections were exclusively used for insulating the thousands of feet of refrigeration pipe lines to the freezers and hardening tunnels, and also for insulating the ammonia vessels in the Engine Room. All the chilled water lines throughout the factory were also insulated with Onazote.

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0.20 B.Th.U/sq.ft. hour °F/inch at a mean temp. of 50°F.

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at 100°F (38°C) and 1-90% relative humidity.
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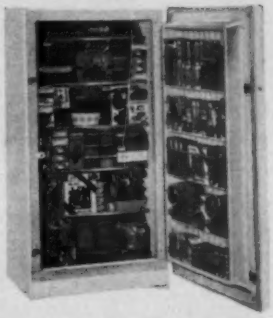

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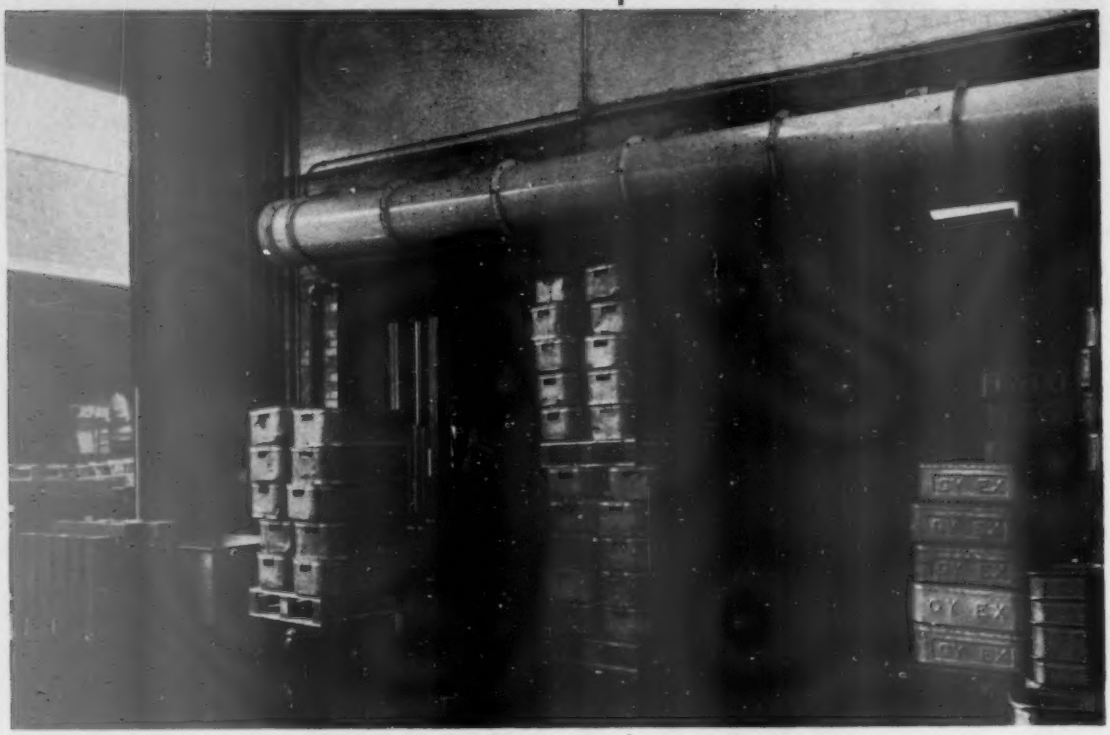

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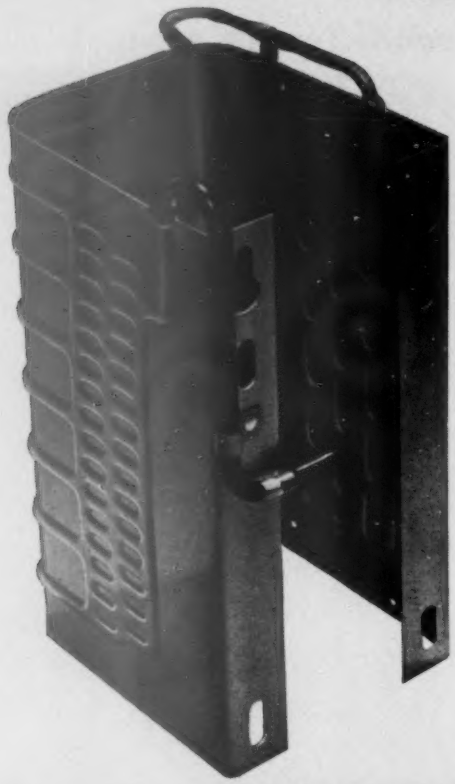

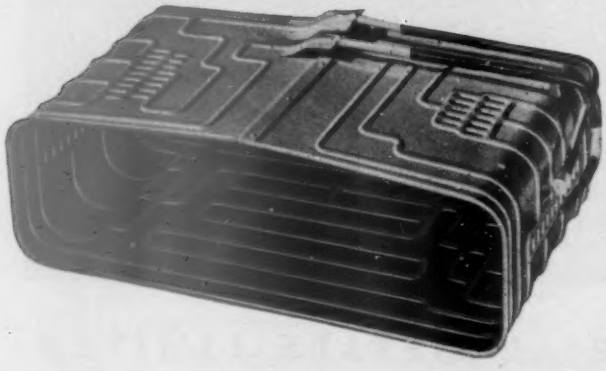

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ENGINEERS required, must be fully experienced and able to undertake installation work. Non-contributory pension scheme in operation.—Watford Refrigeration Ltd., 65 Market Street, Watford. Telephone: 27183. 1587

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PRESSED STEEL COMPANY LIMITED
requires a
REFRIGERATION SALES SUPERVISOR
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Applicants should preferably have experience in selling domestic and commercial refrigerators at supervisor level. Knowledge of service procedures would be an advantage. The position carries a good salary coupled with commission and pension scheme. A Company's car is provided.

Interviews will be arranged locally.

Please apply quoting reference MR/0459 and giving age experience and present salary to the Personnel Officer,
Prestcold Division, Pressed Steel Co. Ltd., Swansea. 14

REFRIGERATION ENGINEER required by York and Kelvinator distributors for installation and field service.—Bisson Radio Co., 27/30 Sand Street, St. Helier, Jersey, C.I. Tel.: Central 20401. 22

REFRIGERATION SERVICE ENGINEER urgently required for installation and service of plants up to 10 h.p. Must be fully qualified and able to drive, also have field experience on most makes. Good pay including expenses. 42-hour week plus overtime. Modern 5-roomed house available for immediate occupation. Apply in Confidence to: Fred Hawkes (Refrigeration) Ltd., Polar Works, 3 & 5 Park Road, Rushden, Northants. 23

REFRIGERATION SALESMAN for London Area. Apply in strictest confidence to E. C. Pounsett, Lec Refrigeration Limited, 217 Regent Street, London, W.1. 9

SERVICE AND INSTALLATION ENGINEER required. Must have electrical background. Apply to A. N. Culley, Service Manager, Modern Supply Co., Hamilton, Bermuda. 29

SERVICE AND INSTALLATION ENGINEER required. Experience continuous freezers, dairy and refrigerating plant.—Clarke-Built Ltd., Power Road, Chiswick. Phone: CHI 7631. 1551

UNILEVER LIMITED have a vacancy for a Refrigeration Engineer in their London Office. Applicants should have received fundamental training in refrigeration and should have had substantial practical experience in this field. It is desirable that they should be knowledgeable on at least the first two of the following three subjects: 1. refrigerated transport vehicles; 2. large industrial refrigeration plant; 3. cold store design. Candidates should preferably be corporate members of the Institute of Mechanical Engineers and should have obtained a Diploma in Refrigeration Engineering. Salary will be compatible with experience. Applications, in writing, giving details of training and experience, should be addressed to Head Office Staff Department (WF/62), Unilever House, Blackfriars, London, E.C.4. 17

WINGET LIMITED of Rochester, Kent, due to expansion programme require the following staff:—Draughtsman, experienced refrigeration, capable of layout, design of complete systems, and component detailing. Some electrical and production knowledge an advantage. Designer/Draughtsman for Wire Mill Machinery. Experience in machine tool design or jig and tool or high-speed transmissions. Draughtsman/Mechanical Designer for truck mixer, concrete mixers, general mechanical handling equipment. Draughtsman/Structural Designer for batching and mixing plants. Apply: Personnel Manager, or 'phone Strood 7276. 19

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REFRIGERATION ENGINEER. Age 37. A.M.I.Plant.E. 16 years' experience. Requires plant engineering position. Experienced in low temperature applications. Returned from Canada July 1960. Will consider anywhere in England.—Box 25. 25

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2 J. & E. HALL twin cylinder Ammonia Compressors 7½" bore × 7½" stroke, vee-belt drive, C.P. motor 400/3/50, A.C. 90 b.h.p. running at 1,000 r.p.m., complete with Allen West starters, shell and tube condensers and evaporators, brine and water pumps, excellent condition, reasonable price. 1 Sterne 4W7½ Ammonia Compressor 7½" bore × 6" stroke, vee-belt drive, C.P. motor 400/3/50. A.C. 78 b.h.p. running at 1,000 r.p.m., complete with Igranic starting panel, shell and tube condenser and evaporator, centrifugal brine and water pumps complete, excellent condition, reasonable price. —Box 11. 11

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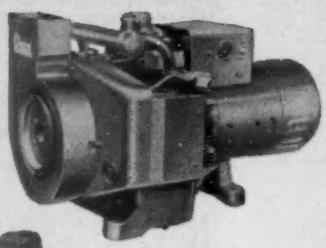

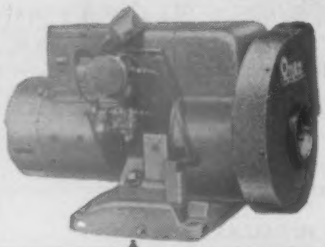

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Established 1898

VOLUME 63 NUMBER 749

AUGUST · 1960

Contents

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Editorial . . . .

Fridges—up, up, up
Accelerated Freeze-Drying
Accelerated Food Thawing
European Food Traffic

● On an early page in this issue will be found details of a new development in food preservation, namely, accelerated freeze-drying. Vickers have already built and installed the world's first commercial plant of this kind, with a capacity of 150 tons a month. Advocates of this system claim that almost any food preserved by it will stay fresh for a year or more at normal temperatures—packed in the simplest of wrappers. The processed food is often less than 10 per cent. of its original weight. It will be remembered that A.F.D. was developed by the Ministry of Agriculture, Fisheries and Food. Because the food is flash-dried in a high vacuum the moisture takes nothing away with it—not even the colour or the aroma, it is claimed. The taste, the calories and vitamins remain the same. It would appear that all that remains to be tested is the housewife's reaction to this food that has been " treated."

● The convenience of frozen food is thought by some to be marred by the considerable time needed to thaw out certain products. For instance, at present fish is thawed industrially by laying it out in the air: it is sometimes, in addition, sprayed with water. Under these conditions, fish on the outside of a block thaws quickly and begins to deteriorate, while that in the middle remains frozen. Apart from possible deterioration, however, existing methods are slow, require much labour and factory space, and are unsuitable for fish factories with production lines. The new method of dielectric thawing requires no handling during thawing, is quick and therefore keeps deterioration to a minimum, and the equipment occupies only a few square yards of floor space. The capital cost—about £10,000 for equipment to thaw one ton of fish per hour—is comparable to that for freezing equipment of similar capacity. Running and depreciation costs appear to compare favourably with the costs of existing methods of thawing.

● This method of thawing of frozen fish, which normally takes up to 24 hours in air, can be done in about 15 minutes by dielectric heating. This new development, which solves a major problem of the fish industry, is the result of work at the Torry Research Station of D.S.I.R. It is of great economic importance, especially in view of the steadily increasing large-scale utilization of frozen fish, and may have wide application in other sections of the food industry. The method, known as dielectric thawing, depends on the fact that if any material is placed between, but without touching, two metal plates which are charged with an alternating voltage of many thousands of volts at a frequency of about 40 million cycles per second, energy is produced in the material in the form of heat.

● Despite the reported depression in the shipping industry, new vessels, both passenger and cargo, continue to pass down the slipways, with some regularity if not frequency. Another refrigerated cargo liner for the Shaw Savill Line was launched recently at the Belfast shipbuilding yard of Harland and Wolff Limited. She was named *Icenic* by Mrs. J. Ormond, wife of Mr. John D. Ormond, B.E.M., chairman of the New Zealand Meat Producers' Board. The *Icenic* is the twenty-second vessel built for the line since World War II. Shaw Savill has an impressive record of new building since 1945, the *Icenic* bringing the total to well over a quarter of a million tons. This continuous building programme gives Shaw Savill one of the most modern fleets in the world to-day. It is of interest to note that this is the eighth post-war Shaw Savill vessel to be built by Harland and Wolff Limited. These include the world-famous *Southern Cross* (20,204 tons). *Icenic* will be a single-screw motor vessel of approximately 11,250 gross tons, and is the third of her class. Her general design will be similar to the motor vessels *Ionic* and *Illyric*, already successfully in service. She will have a service speed of 17 knots and in her six cargo holds, four of which will be insulated, she will have capacities of about 410,000 c.ft. for refrigerated and chilled cargo and about 245,000 c.ft. for general cargo. This vessel will, of course, bring back to these shores during her lifetime a vast amount of Australiasian meat which is the cue for our saying that we had the pleasure of being present last month at a Press conference to inaugurate a nation-wide campaign for New Zealand lamb; this took place aboard the well-known N.Z. shipping line's vessel *Rangitata*. This delightful excursion down the Thames was organized by The New Zealand Meat Producers' Board through Erwin Wasey, Ruthrauff & Ryan Limited. The Board has set up a bureau providing an information service on all matters concerning N.Z. lamb.

● Hire purchase restrictions on appliances harden and ease and then harden again, chancellors come and go and yet the British refrigeration industry continues to smash records. Both home and export sales of domestic refrigerators were well up again in May, according to the figures issued recently by the Domestic Refrigeration Development Committee. Sales of British-made domestic refrigerators on the home market totalled 137,279, compared with 125,881 in May of 1959—an increase of 9 per cent. This is the highest monthly total ever achieved by the industry and brings the total sales at home for the five months from January-May to 526,829. This, in fact, exceeds the total sales for the whole of 1958;

in the twelve months of that year they were 448,646. Export sales increased by 76 per cent. compared with May 1959. The export figures for May 1960 are greatly in excess of any previous month and are effective proof of the value of a substantial home market as the basis of a vigorous export drive.

● Interfrigo, the international railway-owned company which specializes in refrigerated transport of perishable foodstuffs and which is becoming of greater importance with the success of the European Free Trade Area, increased its traffic by over 32 per cent. during the first five months of this year compared with the same period in 1959. Traffic has grown steadily with the progressive development of the company since it was formed in 1949. Last year it carried 84,000 wagon loads of refrigerated and insulated produce which was four times as much as in 1951. Of this total, 4,700 wagon loads passed between the Continent and Great Britain via the British Railways' Dover-Dunkerque and Harwich-Zeebrugge train ferries. Interfrigo, which are now the biggest international carriers of perishables in Europe, have as members twelve of the railway administrations of Western Europe, including British Railways. Although the capital of the company is small—6.3 million Belgian francs—the value of its fixed assets at the end of 1959 was 450 million Belgian francs, and this will be increased to 650 million by the end of 1960. Interfrigo operates partly with its own rolling stock, and partly with wagons hired from member administrations or their subsidiaries. The first series of Interfrigo's own wagons, 525 in number, came into service in 1951/52. A further 383 wagons were built in 1957/58, and 300 more wagons are being built and 500 purchased so that by the end of 1960 the total stock owned by the company will exceed 1,700.

● The financial policy of Interfrigo has always been to create increasing support for its members and not to make large profits. It is in line with this policy that Interfrigo has amortized its rolling stock to the largest possible extent, and the reserve thus created will enable the company to cover without difficulty the cost of major overhaul of the wagons which will shortly fall due. Interfrigo has great faith in the continued development of international perishable traffic by rail. Increased production of fruit and vegetables is taking place in all producer countries; the demand in consumer countries is increasing as a result of improved standards of living; and new markets are being opened as a result of the better technical transport facilities available. All this means a greater demand for transport with refrigeration. In Italy, for example, it is anticipated that exports in 1964 will be 50 per cent. more than in 1954. Interfrigo is increasing its rolling stock because of its confidence in the continued expansion of business. The annual report of Interfrigo for 1959, marking the 10th anniversary of the company, was presented recently in Brussels.

Single Duct Induction in Modern Buildings

A PAPER on "Single Duct Induction in Moder Buildings" was read by Alun J. Roberts, M.A., A.M.INST.R., before a meeting of the Institution of Heating and Ventilating Engineers, recently. The transition from heating buildings and natural air change through heating and controlled fresh air to full air-conditioning with individual control at distribution points was traced. Single-duct induction units were illustrated and described, and their application to modern buildings was discussed.

In the course of his paper the speaker said:—

"The modern office block may have well-sealed windows which reduce the natural infiltration of outside air and increase the need for mechanical ventilation. When the proportion of glass area to wall area is high, as it is in most buildings with curtain walling, there is also an increased need for cooling and heating. Thirty years ago walls were about one-third glass—to-day glass often makes up two-thirds of the area. Because of this increased glass area and the resulting 'greenhouse effect,' owners of buildings are nowadays often prepared to invest in large refrigeration plants for their comfort-conditioning equipment, particularly since an increase in personnel operating efficiency of about 7 per cent. can be expected when an air-conditioning plant is installed.

"The single-duct induction unit supplies the room with treated outside air for ventilation, as well as heating or cooling, at the point in the room where they are most needed—the window.

"As most of the heating and cooling load is carried by water, the size of the air ducts is reduced to a minimum. A 9-in. diameter duct with air at 3000 ft./min. has the same heat-carrying capacity as a ½-in. diameter pipe with water at 5 ft./sec, if the same temperature drop is assumed in both cases.

"The three essential components of a single-duct induction unit are a pressure chamber, a jet (or jets) to induce a flow of room air and a heat exchanger. Primary air, from a central plantroom, comes into the pressure chamber where the pressure is 0.75 in. w.g. and leaves the jets with a velocity of about 3000 ft./min. This induces room air to flow through the two heat exchangers, where it is heated or cooled by hot or chilled water according to the season and then mixed with the primary air. The induction ratio is about three parts of room air to one part of primary air, but this can be greatly increased if the pressure in the lower chamber is increased; unfortunately, this also increases the noise level. The capacity of this unit is controlled by moving dampers which allow some of the room air to by-pass the heat exchangers: these two dampers work in sequence because this has been found to give almost 'straight line' control, i.e. equal angular rotations of the control knob give almost equal changes in capacity. With this unit, the room air enters the enclosure through a slot which runs under the window behind the unit—this device avoids a cold downdraught in winter."

NEWS OF THE MONTH

Refrigerated and A-c Exports.—During June, 1960, air-conditioning and refrigeration machinery (commercial and industrial sizes) to the value of £712,329 weighing 961 tons, was exported from the United Kingdom. Comparable figures for June, 1959 were 882 tons, worth £620,671.

* * *

Exports' Analysis.—Of of the 961 tons of air-conditioning and refrigerating plant worth £712,329 exported by Great Britain in June—quoted in the preceding paragraph—30 tons went to the Union of South Africa, 40 tons to India, 44 tons to Australia, 25 tons to New Zealand, 23 tons to Canada, 210 tons to "other Commonwealth countries," 60 tons to Eire, 11 tons to Sweden, 229 tons to Western Germany, 46 tons to the Netherlands, 33 tons to Belgium, 20 tons to France, 20 tons to Italy, and 164 tons to "other foreign countries."

* * *

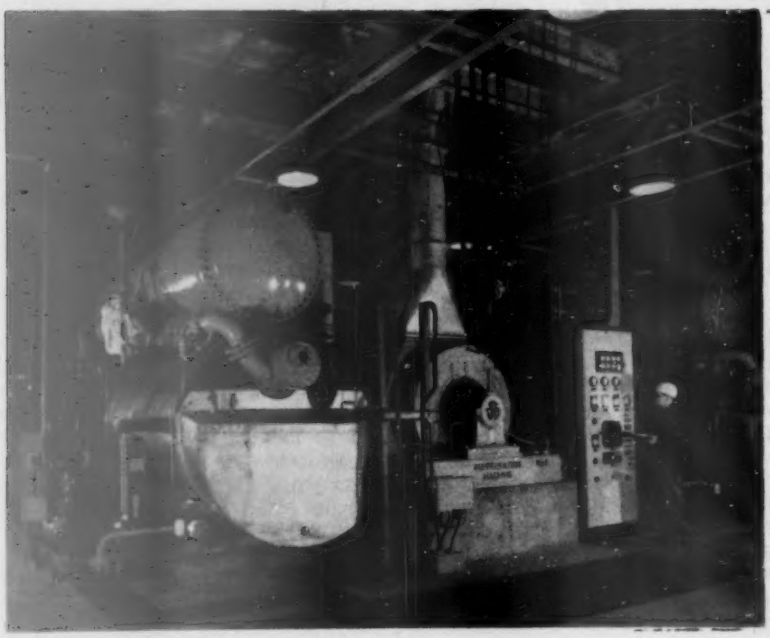
Refrigeration Plant Classified.—Of the total exports of air-conditioning and refrigerating machinery during June, commercial refrigerators accounted for 320 tons, worth £167,150, industrial plant and equipment for 162 tons worth £107,010, and refrigerating machinery, equipment and parts including parts of commercial refrigerators, for 306 tons, worth £269,147.

* * *

Exports of Small Refrigerators.—During June, 1,227 tons of complete refrigerators and domestic refrigeration equipment were sent overseas from Great Britain. These exports were worth £730,720. The 1,227 tons comprised 39 tons to the Union of South Africa, 17 tons to Rhodesia and Nyasaland, 6 tons to India, 67 tons to New Zealand, 67 tons to "other Commonwealth countries," 46 tons to Sweden, 102 tons to Western Germany, 44 tons to the Netherlands, 5 tons to Belgium, 11 tons to Italy, and 316 tons to "other foreign countries."

I.H.V.E. AMSTERDAM MEETING

THE Institution of Heating and Ventilating Engineers held its 1960 Summer Meeting in Amsterdam from June 25 to 29. This was the outcome of a recent decision of the Institution to broaden its interests by supporting foreign conferences relevant to its activities.



Refrigeration plays an important part in the neoprene synthetic rubber process at the Maydown Works of the Du Pont Company (United Kingdom) Ltd., near Londonderry. Temperatures in the process must be held below the level that can be achieved with cooling water. The two refrigeration machines at Maydown, the largest units in the United Kingdom, could make a block of ice as large as a double-decker bus every hour. (N.B. The plant was opened on July 26 by Lord Wakehurst, Governor of Northern Ireland.)

Two of the papers presented at the conference were by Dutch Engineers; one of these formed part of a symposium of four papers comparing the various types of high velocity air-conditioning systems now being marketed, in relation to a typical multi-storey office building.

* * *

H.M. the Queen has accepted the gift of a lamb carcase from the first consignment of lambs to arrive in Britain from the new Alliance Freezing Works, opened recently at Lorneville, Southland, New Zealand. The gift was arranged by Lord Macpherson, chairman of Macpherson Train & Co. Ltd., the importers to whom the lambs were consigned. The lambs were on show on July 6, at the Blackfriars cold store in Upper Thames Street, London. Lord Macpherson was host to a small party of guests including Mr. John Ormond, chairman of the New Zealand Meat Producers Board, Mr. J. de Gruchy, general manager of the board—both of whom are visiting Britain—and Mr. D. L. Martin, the board's British representative. The event had particular interest for Mr. Ormond in that the opening of the new freezing works was one of his last public duties in New Zealand before he left for Britain.

* * *

T. Wall & Sons (Ice Cream) Ltd., have recently put a large cold store into operation in Islington to serve a heavily populated area which takes in North Kensington, Paddington, Stepney, St. Marylebone, Hampstead, St. Pancras, Islington, Stoke Newington, Hackney, Shoreditch, Bethnal Green, and Finsbury. The new depot has a large cold store where about 2,000,000 portions of ice cream can be stored at –50° F. below freezing.

* * *

Scheduled for opening in early September is the A.E.I. Hotpoint Ltd. Home Centre on the corner of Oxford Street and John Princes Street, London, W.1. The new premises will occupy 6,000 sq. ft. on the ground floor and lower ground floor.

* * *

As a result of general expansion within the "Vendo" division of Joseph Sankey & Sons Ltd., Wellington, its sales department has moved from the Hadley Castle Works, Wellington, Shropshire, to London. All correspondence and enquiries, other than on delivery, servicing or technical matters, be addressed to : the sales manager, "Vendo" division, Joseph Sankey & Sons Ltd., 168, Regent Street, London, W.1. Phone : Regent 3261.

* * *

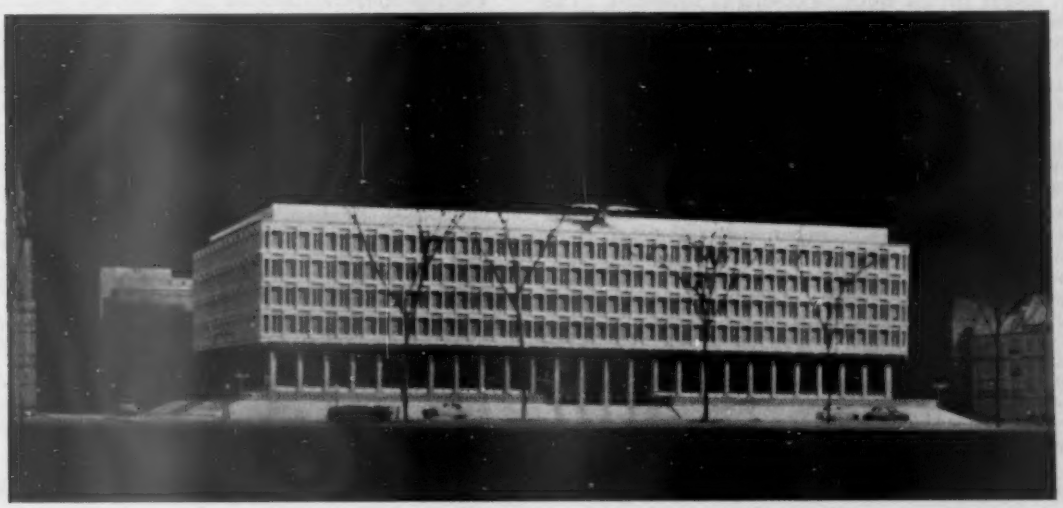
ELECTRICAL APPLIANCES SALES

The following return shows the number of new appliances sold by area electricity boards in England and Wales for the month of February and for the 12 months ended February 29, 1960, together with the percentage changes over corresponding periods of the previous year. These sales by area boards represent, of course, only a part of total sales throughout the country.

	Sales in month ended February 29, 1960		Sales in 12 months ended February 29, 1960	
	Total	Percentage change over corresponding period of previous year	Total	Percentage change over corresponding period of previous year
Cookers	27,334	+ 13·4	341,605	+ 23·0
Water Heaters :				
Immersion	8,980	+ 9·5	191,193	+ 15·2
Storage	5,438	+ 22·5	61,934	+ 20·2
Wash boilers	4,930	– 5·8	65,725	– 17·2
Washing machines	11,969	– 7·1	159,888	+ 31·5
Refrigerators	5,335	+ 51·1	167,767	+ 110·4

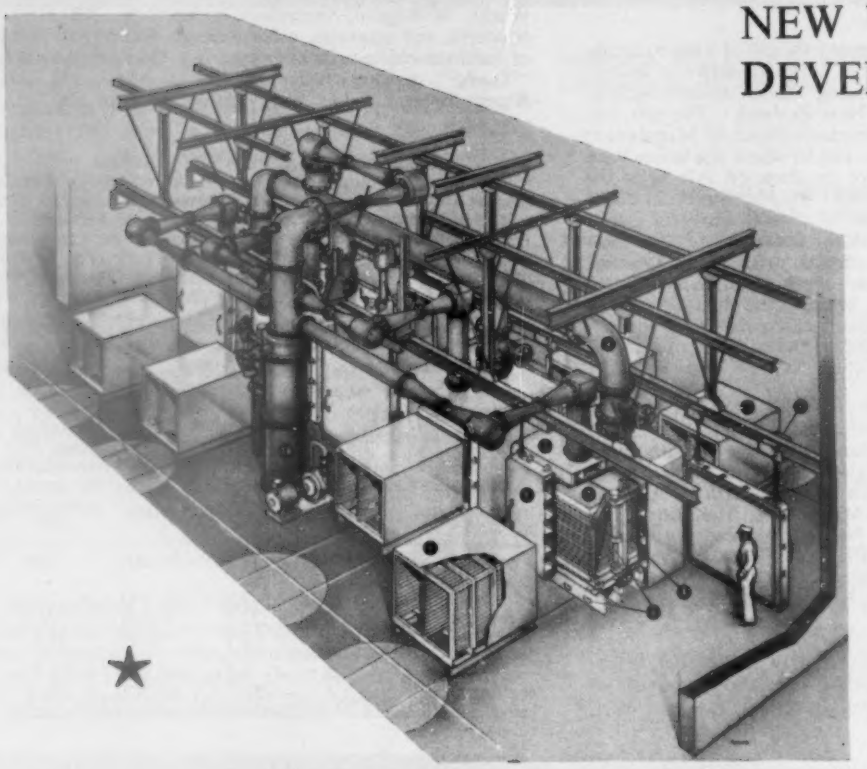
Picture of the Month

The new building in Grosvenor Square about to be occupied by The United States embassy has been fully air-conditioned by York Shipley Limited of London.



Accelerated Freeze-Drying

NEW VICKERS DEVELOPMENT



Drawing of the Vickers freeze-drying equipment. 1—vacuum cabinet; 2—heater plate and pressure assembly; 3—heater plate and door hydraulic closure systems; 4—heater plate water connections; 5—pressure/vacuum tight door; 6—door suspension trolleys; 7—loading stillage; 8—unloading stillage; 9—steam vacuum plant; 10—main condenser.

FOODSTUFFS in increasing variety are being subjected to accelerated freeze-drying as a commercially applied system for the batch processing of foodstuffs. This interest has been stimulated recently by an announcement from the Irish Sugar Company of its proposal to install at Mallow, County Cork, an accelerated freeze-drying plant designed and built at the South Marston works of Vickers Limited, "M.R." learns from this company.

This unit represents the culmination of a long search for a commercially feasible freeze-drying process by the Aberdeen Food Research Unit of the Ministry of Agriculture, Fisheries and Food. Vacuum-dried foodstuffs have many commercial potentialities among which are extended store-shelf life at ordinary temperatures, ease and economy of transportation and elimination of bulky storage equipment. The advantages are even more pronounced if removal of moisture is effected from the solid-ice phase because there is no shrinkage of the material, virtually no impairment of taste, texture or colour, and reconstitution of the product is in most cases almost instantaneous. The product derived from freeze-drying can be subjected to prolonged storage at ordinary temperatures, provided it is packed in a material impermeable to moisture and oxygen.

Until now, however, freeze-drying has not been a commercially feasible proposition. In the past the process has been applied only to commodities such as blood-plasma, pharmaceutical and similar products where the cost of preparation has been relatively small in relation to the value of the raw materials.

One of the major technical problems in the design of suitable equipment has been the transfer of sufficient heat to the food in order to produce the required rate of sublimation of the ice. The present process developed at Aberdeen relies on the direct conduction of heat from top and bottom heating plates to the food, via expanded metal sheets for vapour release ; the food and the plates being held in continuous contact by subjecting them to mechanical pressure. This method, while proving eminently satisfactory both for research and production, does involve the processor in slightly higher costs than would perhaps, be acceptable to a firm working on small-scale production. Vickers-Armstrongs is carrying out research, with promising results, to simplify the machinery, speed up the drying and processing time, and reduce the costs involved.

The initial cost of the cabinet is high, owing to the complex mechanism involved in the pressurizing equipment, which additionally increases the risk of mechanical failure.

If the equipment is to be thoroughly competitive on a large scale, it must of necessity, be a continuous processing

system employing a complicated system of rollers or a belt drive, working under pressure, with the need for a variable geometry arrangement for the pressurizing plates. Fragile materials would be likely to suffer through movement under pressure. An interesting point to be considered from the pressurizing aspect is that with a working pressure of 8 lb. p.s.i. over an area of 24 sq. ft., a total pressure of 12½ tons has to be applied and maintained throughout the working cycle.

It can readily be seen that some other form of heating is desirable. Owing to the high vacuum (approximately 1 mm. Hg. absolute) it is not practicable to rely on a heat transfer by gas conduction or convection and the only alternatives are by dielectric or radiant heating. The heterogeneous nature of the foodstuffs has given rise to certain problems in the use of the former method and considerable research will be necessary before it will be available for commercial application.

Research in Two Countries

The use of infra-red heating has been studied by both the Defence Research Medical Laboratories in Canada and by the Ministry of Agriculture, Fisheries and Food at Aberdeen, and results have shown that with suitable temperatures and tray materials, comparable rates should be achieved. Vickers research in this direction has produced satisfactory results and at present concentration is on a fairly low working temperature. It has been found that too high a temperature is not suitable owing to inconsistent drying, and the food responds better to as low a temperature as possible. Experiments are being carried out with a maximum temperature of 150° C. with promising results. This temperature can be attained by water or electrical heating, and heating trials carried out by the Ministry of Agriculture, Fisheries and Food in collaboration with Vickers have shown that the finished article exhibits no significant difference between the two methods.

Research is also being undertaken to establish the extent to which the ultra long wave infra-red assists in the drying process. These rays existing at radiating temperatures between 70° C. and 240° C., are capable of deep penetration and may result in a significant reduction in drying times over the double contact method.

To establish the feasibility of a commercial unit, based on these principles, a research programme to investigate the general problems of the system has been initiated. Foremost among these is the provision of a suitable tray for the carriage of the foodstuffs. Initially an expanded metal or plastic tray about 1 in. deep will be employed. This may be used with an expandable polythene sheet and will transmit 80 to 90 per cent. of the radiation. In the experimental stage, an electrical heating system will be used, but for commercial application, it will be possible to use water heating if required.

Infra-Red Heating

Apart from the general simplification of the working mechanism, the infra-red system has several indirect advantages. Owing to the deletion of the pressurizing and closure systems, the cabinet can be slightly smaller for the same food load and any possible damage to food by pressure is virtually eliminated. The absence of the pressure plates greatly enhances continuous processing, and the reduction in heat capacity of the system in direct contact with the food, particularly when using plastic trays, will enable a more uniform freezing to be obtained. The better penetration of infra-red rays results in the elimination of the need for accurate food thickness control, with consequently lower production costs.

The decisive factors in the acceptance of accelerated freeze-drying as a new media for food will undoubtedly be its lack of weight and bulk, and ease of storage. Alternative methods suffer from these inherent disadvantages ! disadvantages which are markedly prevalent where long distance transport or indefinite storage periods are involved. The deep-freeze system is further complicated by the necessity for specialized refrigerating equipment throughout the whole of the distributing and selling side, entailing high operating and maintenance costs. Accelerated freeze-drying with its uncomplicated transport and storage requirements bears none of these expensive aspects.

The housewife will also welcome this new concept of food presentation. The simplicity of preparation combined with the elimination of the necessity to cook the food on the day of purchase in the absence of the domestic refrigerator, will, it is felt greatly enhance its superiority as an easy, desirable form of food.

In view of the ever expanding market for prepacked and processed foods accelerated freeze-drying is certain to prove successful in competition with conventional processive methods.

MR. H. G. JAEGER

MR. H. G. JAEGER, that well-known leader in the cold-storage industry, has given up his executive position of general manager of Chambers Wharf and Cold Stores Ltd., London, while retaining his directorship in the company.

It will be recalled that Mr. Jaeger was joint founder, with Mr. Charles Goldrei, the chairman, of Chambers Wharf in the mid-20s.

Mr. Jaeger is continuing all his other connexions with the industry, including his directorship of The National Cold Stores (Management) Ltd., in the formation of which at the end of Control he played a very large part. He is a life member of The Institute of Refrigeration and it is understood that he intends to continue to serve on the various councils of the cold storage and wharfaging industries with which he has been so long connected Mr. Jaeger was a departmental director of The Ministry of Food during the war, being largely responsible for the buffer depot storage scheme, and also for the Ministry's arrangements for storage at the ports at the end of the war.

Having pioneered the storage of quick-frozen foods on a commercial scale in 1936, Mr. Jaeger was instrumental in persuading cold stores up and down the country to cater for this new trade after the war.

NEW LEC MODEL

A new model to be introduced shortly by Lec Refrigeration Ltd., Bognor Regis, is the S.130, specifically designed to meet the requirements of hoteliers, caterers and shopkeepers. Special features of the S.130 are adjustable shelves, automatic interior light and thermostat control to adjust the interior to the required temperature, and a large evaporator for ice making. The door liner is fitted to accommodate eggs, butter and fats, with three racks for bottles. This cabinet has a capacity of 13 c.ft. which gives a shelf area of 25 sq. ft. while it occupies the minimum of floor space. It is powered by the Lec hermetically sealed Vertimetic unit incorporating a single-cylinder compressor. Price of this model is £115.

NEW 114,000 c.ft. COLD STORE

Westwick Frosted Foods' Expansion

AN extensive programme of expansion that began in 1959 at the factory of Westwick Frosted Foods Ltd., Westwick, Norfolk, was brought a stage nearer completion on June 16 when a new 114,000 c.ft. cold room was opened by Mr. Jack Vincent, managing director of the Ross Group Ltd., the parent company. The whole of the design work for the new store was carried out by Westwick staff and refrigeration was supplied and installed by J. & E. Hall Ltd., Dartford.

The store has an internal height of 17 ft. 2 in. and is insulated on walls, floor and ceiling with polystyrene. The plant is designed to maintain a temperature of −10°F. in the store for the purpose of storing pre-frozen products and is also capable of dealing with an input of 60 tons per day frozen products at a temperature of + 10°F.

In addition to cooling the main store, the plant is also capable of maintaining an assembly room, which is adjacent to the store, at a temperature of approximately 0°F. by means of "spill out" cold air from the low temperature store. The capacity of the assembly room is 22,000 c.ft.

The plant incorporates two Hall twin cylinder compound ammonia compressors each driven through vee belts by a 35 h.p. slip ring induction motor, both machines operating simultaneously under maximum conditions during loading period etc. but one compressor would be capable of holding the store under normal conditions. The machines operate in conjunction with a common multitubular water cooled condenser comprising three casings 8¾" o.d. x 13′ 0″ long arranged over a horizontal liquid receiver.

Intercooling of gas between stages of compression is provided for by automatic flash type intercoolers incorporating liquid cooling coils.

Gridded Installation

The cooling arrangement inside the store is somewhat novel inasmuch as it is designed on the basis of a gridded installation, but contrary to the usual practice of arranging the cooling pipes mainly on the ceiling of the store, in this case all the cooling surface is arranged round the three walls of the store. This takes the form of wide spaced square gilled tubing arranged double banked, carried on side supports and designed for low pressure ammonia pump circulation. To assist convection currents in the store a number of small propeller type fans have been arranged at ceiling level, these being fitted in baffles and arranged to circulate air from the centre portion of the store over to the side banks of grids. Heated drip trays are arranged below all of the cooling grids and liquid suction and hot gas control valves are conveniently positioned so that any one circuit can be defrosted without affecting the operation of the store.

The main advantage with this arrangement in the low temperature cold store is that all cooling surfaces can be defrosted without the usual procedure of moving the produce in the store, and as a result of frequent defrosting the plant can be maintained at maximum efficiency. In brief, the cooling system produces the same effect as that normally obtained from a gridded store but without the disadvantages necessitated by defrosting. A horizontal suction separator is arranged in an insulated room adjacent to the cold store from which ammonia liquid is circulated by means of a rotary type pump through the various circuits.

The plant is completely automatically controlled by means of duplicate thermostats operating in series.

A general view of the new Westwick cold store and, left, the hatch through which frozen, unwrapped peas are conveyed to the packing machine adjacent to the store.

REFRIGERATED VEHICLE TRANSMISSION

New Developments

TWELVE months' exhaustive tests on designs of transmissions for refrigerated vehicles, by Thomas Broadbent & Sons Ltd., in collaboration with J. Lyons & Sons Ltd. and L. Sterne and Co. Ltd., have recently been completed (the project is referred to in MODERN REFRIGERATION, January 1960).

Broadbents, the original manufacturers of the centrifugal clutch, have instituted special production methods to ensure the maximum efficiency offered at the correct selling price. Working parts are reduced to a minimum, and stock shoes and accessories for replacement purposes can be supplied within 24 hours from the request being placed.

An important factor of the Broadbent centrifugal clutch is its ability to engage the load gradually without shock, reducing wear on the driving unit. and the driven machine. It is equally effective in either direction of rotation, gives a better power factor during acceleration, and acts as an automatic safety device in the event of an overload by limiting the torque transmitted, the shoes continuing to slip until the load is reduced to normal. Spring controlled shoes are fitted which hold back until the driving unit has attained 40-75 per cent. full speed. Centrifugal force then throws the shoes radially outwards until they engage with the interior rim of the driven half, gradually accelerating it to full speed; the drive then becomes positive.

The duties of the clutch in this particular application are:—

1. To provide easy starting of the diesel engine automatically by virtue of the clutch's no-load characteristics up to a controlled predetermined speed.
2. During nights when the vehicle is garaged, the compressor drive is automatically transferred to a mains driven electric motor as the spring controlled shoes of the centrifugal clutch automatically disengage the petrol/diesel engine.

Operation is at a high rotational speed of 2,000 r.p.m. when driving, and the clutch is automatically controlled to pick up at the speed recommended by the diesel/petrol manufacturers.

The actual test concerned six vehicles from Mann Egerton & Co. Ltd., 40 vehicles from J. Lyons and Sons Ltd., and 16 vehicles from L. Sterne & Co. Ltd.

The trial has established that minimum maintenance is necessary and that the centrifugal clutch has withstood the arduous conditions with complete satisfaction and reliability, which is proved by the repeat orders obtained.

United Kingdom selling agents for these clutches are Fleming, Birkby & Goodall, West Grove Mills, Halifax.

New Branch for Prestcold

Another step in the development of the Prestcold regional marketing plan has been taken with the purchase of premises in St. Giles, Oxford. They will form the headquarters of the company's newly created Oxford branch. The premises—part of which are estimated to be some 400 years old—occupy a first-class trading position in the city. Following structural alterations and modernisation they will provide accommodation for a showroom, storage space and offices. Sales and service facilities will also be provided by sub-branches at Reading and Swindon. The function of the branch will be to sell and to provide service for Prestcold Commercial and Industrial Refrigeration Equipment. It will also handle the distribution to the trade of the company's domestic models and any other products as they become available. The branch will begin limited operation in August and will continue on the basis of gradual expansion until the early part of next year, at which time it is anticipated that sales and service facilities will have been extended to cover the whole of the territory.

FOOD PACKAGING EXHIBITION

Over 15,000 sq. ft. of stands have been booked so far for the Fresh Food Packaging Exhibition, to be held at Alexandra Palace, London, from November 1st—4th. The exhibition will give information about the latest food handling, packaging and general marketing techniques.

The object of the exhibition is to provide farmers, wholesalers, merchants and retailers with up-to-the-minute information on machines, materials and methods designed to bring about increased sales of meat, bacon, poultry, eggs, cheese, potatoes and other vegetables, and fruit. Over 60 firms will be taking part.

Machines for handling, packaging, prepacking, vacuum packing, collating, counting and processing will be demonstrated. All kinds of modern packaging materials for food will be on display.

Tickets, which are free of charge, are obtainable on application to Brooks Publicity Services, 6 London Street, Paddington, London, W.2. A series of conferences are also to be run at Alexandra Palace at the time of the exhibition. Details will be announced shortly.

MONSANTO BULLETINS

Two technical service bulletins on the chemical resistance of polythene and the impact testing of polythene film have been issued by Monsanto Chemicals Ltd. The first gives a comprehensive list of chemicals and indicates their effects on polythene, and the second gives an account of the company's own dart drop impact strength test for film.

RAPID COOLING AT NEW BELGIAN SLAUGHTERHOUSE

Frigidaire Installation

Sides of beef being conveyed through one of the four rapid cooling tunnels in the new Ostend city slaughterhouse. Frigidaire forced draught evaporators are mounted at ceiling level.

HIGH efficiency in the rapid cooling of freshly-killed meat makes the new official City Slaughterhouse at Ostend an outstanding example of modern applications of refrigeration. The slaughterhouse, which was recently opened by the Governor of West Flanders, is equipped throughout with Frigidaire refrigeration, comprising a total of 14 condensing units and 34 forced draught evaporators. More than 720,000 B.t.u. of refrigeration capacity is involved.

The slaughterhouse has four tunnels for quick cooling of freshly-killed animals; two are for beef, one for mutton and veal and the fourth for pork. The beef cooling tunnels each cool 45,000 lb. of beef sides from a temperature of 99°F. to 36°F. in 20 hours, while the other tunnels are designed to handle 25,000 lb. each of small carcasses, bringing them down from a temperature of 100°F. to 36°F. in 14 hours.

One of the features of this new system of quick cooling is that the temperature is reduced with the minimum loss of weight. The results obtained during first tests showed that the reduction of weight in freshly-killed beef was no more than 1.2 per cent.

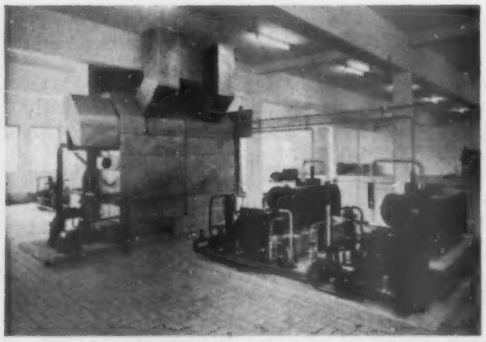
Results such as this are achieved by programme control of the temperature and humidity. For each tunnel there are two condensing units, a four cylinder open type compressor unit of 15 h.p. and a semi-sealed water-cooled condensing unit of 3 h.p. Both are controlled to a programme by an electric clock. To begin, both units run together and, following a pre-arranged schedule, the speed of the larger unit is reduced, the smaller unit then cuts out and finally cuts in again, when the larger compressor cuts out altogether. This system permits the extraction of heat at the rate required.

The humidity is regulated by a hygrostat which, controlling the opening of a solenoid valve, permits hot refrigerant gas from the compressor to be diverted through a heating coil installed in each tunnel.

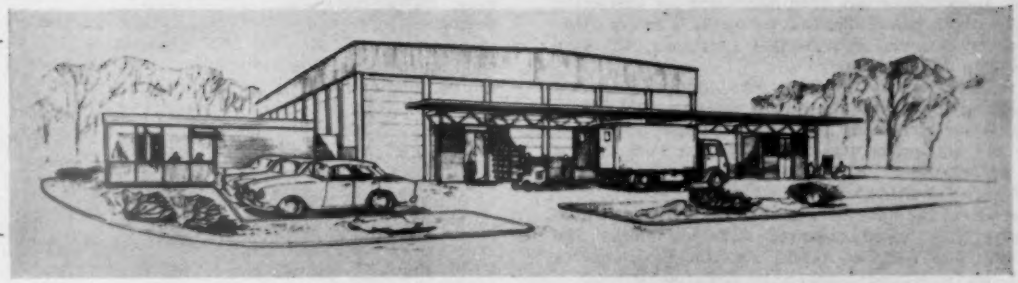
To reduce the consumption of water in condensing the Freon refrigerant, one large evaporative condenser has been installed. The water saving is 96 per cent. of normal requirements.

Each of the four cooling tunnels is equipped with a number of ceiling-mounted forced draught coolers which are fitted with automatically controlled water defrosting.

The entire installation was carried out by Stevens Brothers, the General Motors Continental Frigidaire Dealer for the Ostend area.



Left, a general view of the machine room. In the foreground is an 18-ft. instrument console behind which can be seen the four pairs of Frigidaire compressors which operate rapid cooling tunnels. Right, Frigidaire 15 h.p. compressors working in conjunction with 3 h.p. condensing units operate the four cooling tunnels. Two of the pairs are seen here, together with the large evaporative condenser which gives a considerable saving of water consumption.



New Thetford Cold Store

A BREAKAWAY FROM TRADITION

AS a commercial venture Mr. G. Williams, managing director of G. Williams Engineering Ltd. and a number of his business associates decided to build a cold store and freezing factory in the Norfolk countryside, on a site adjacent to the main works. The project is now in hand.

The small but growing township of Thetford is very well situated for such a scheme, being within working distance of the Lowestoft and Yarmouth fishing ports, the rich farm lands of Norfolk and Lincoln, and surrounded by the poultry areas of East Anglia ; already considerable interest has been evinced by nationally known organizations as well as local firms.

How to deal with this project was a subject discussed at some length and not unnaturally, it was decided that while this could be no experiment, an intelligent use of new ideas should be made.

Mr. Williams appointed Messrs. Jenkins, Manning, Potter and Clamp as architects for the job, their work at Camberwell, Grimsby and Hull having already attracted attention in the industry.

It was a big task, a 2,000-ton –20° F. cold store, a production factory with freezing capacity for 1 ton per hour with provision to increase to 4 tons per hour at a later date and an administrative and service block—a germ of an idea in September, 1959, which had to be translated into reality by July, 1960. It is true that some preliminary building design was going ahead whilst the planning approvals and business details were being dealt with but it was a tight time schedule by any standards—in itself not conducive to radical changes—but it was this very shortage of time which brought forth the highly imaginative approach which has resulted in the "Williams Cold Store."

Fire Resistance

Unlike previous systems of prefabricated construction the wall structure has an inherent fire resistance of two hours classification ; also a fully continuous double vapour barrier envelopes the insulation, a feature which will reflect in reduced running costs. It is claimed that it has all the low maintenance advantages of traditional building.

The general construction is based on a steel frame with 80 ft. lattice roof trusses at 13 ft. 4 in. centres, precast concrete panels with an attractive white spar finish, an effective reflector of solar heat from the walls. The roof is sheeted with 40 ft. long rigidal aluminium sheets, these are arranged to give a predetermined air flow through the roof space and again provide a durable finish with high solar heat reflective properties.

The vapour barrier is a composite one of aluminium foil-bitumen-polythene, as it was considered that the additional expense in the vapour barriers would be recovered in additional insulation life and low running costs.

No Timber in Insulation

The floor, ceiling and wall insulation is Styrocell foamed polystyrene, no timber is used in the insulation, or on the cold side of the vapour barrier and the fixing technique takes into account any long term movement or shrinkage of either the insulation material of the building itself.

The steel frame is being erected to a tolerance of plus or minus $\frac{1}{8}$ in. and all subsequent components are secured direct to this frame and will take alignment from it. The precast wall units, will thus provide a true plane surface on the inner face, ready to take the vapour barrier and insulation without rendering.

Each stage of the construction is commenced at the rear, including all the refrigeration pipework, electrical trunking, and proceeds in sequence to the front end. Thus, while the frame is being erected in, say, bay 10, precast concrete wall panels are being erected in bay 8, the roof in bay 6, ceiling and vapour barrier in bay 4, insulation bay 2, floor and wall finished in bay 1.

The work at high level requiring scaffolding is separately scheduled for builders and engineers ; for two weeks the builders will form the ceiling and then they will leave the scaffolding for the engineering erection, at the end of the week the engineering work complete on that section, the use of the scaffolding is for the builders on the next section of ceiling.

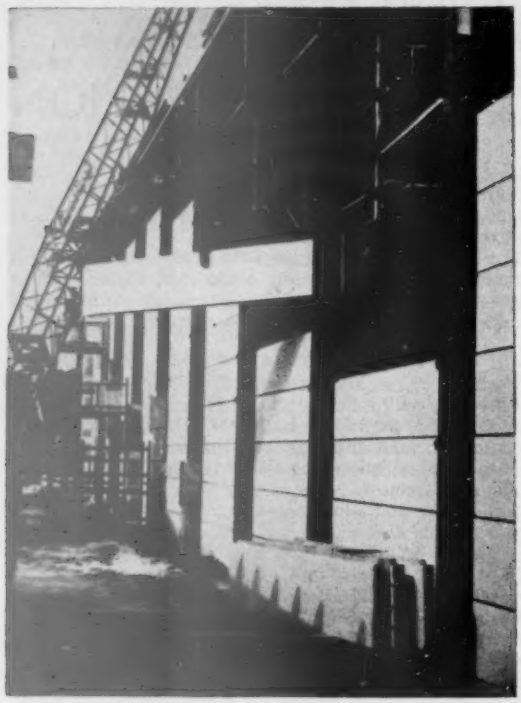
For the machinery and equipment, this was not *fait accompli* for Williams Engineering. The cold storage company put the job to general tender and it is fair to say a little tension existed in the design and estimating office on the morning when the tenders were to be opened and considered. The work went to the associated company who had put in a very competitive price.

The compressors are the units for which Williams are the sole agents in U.K.—the Dutch built "Grasso" all-welded machine. Other machinery is from the Williams factory, including mechanical draught condensers, and square-fin extended-surface ceiling grids.

A special technique has been developed for defrosting these coils which will ensure that no messy floors or other problems are associated with this operation, so often accepted as a difficult one.

The anti-frost heave arrangements consist of an oil circulating system through a series of pipes laid in the floor, a system extensively used in the United States but a fairly new arrangement in the U.K. The same can be said of utilizing heat for this job from the refrigerant in its path to the condenser.

To the side of the store an extension to the main building in precast pre-stressed concrete sections houses the preparation and freezing rooms, also the engine room for both the freezing and store duties, the elimination of the steel work being one more step in the general pattern



Prefabricated concrete panels being lifted into position at the Thetford store.

of the reduction to a minimum of maintenance. The preparation area often suffers heavily due to the considerable condensation which can occur.

The store operation will be with the use of fork trucks and floors and doors have been designed with this in mind. A special feature of the store is the 30 ft. wide cantilevered canopy, this provides covered access between the store and the freezing area and is high enough to accommodate refrigerated vehicles for loading and unloading. Frozen goods can also pass by conveyor belt directly through a hatch from the freezing area into the store.

All access roads and hard standing areas are being constructed in stabilized soil.

As the work proceeds it is clear that the speed of construction is very high, both capital expenditure and running costs are going to be low, the building is and has all advantages of a permanent structure. Jenkins, Manning, Potter and Clamp the architects and consulting engineers, Johnson and Bailey of Cambridge, the general contractors and the Williams Companies have every right to feel pleased with the project, as it will undoubtedly not be the only one they are called upon to build.

YORKOMETRIC H.G.D. COOLERS

A novel diagramatic card, which shows the principles of automatic defrosting employed with their H.G.D. coolers, has been issued by York Shipley Ltd. The card shows the normal method of operation while the change of heating circuit for defrosting is clearly indicated by operating the "pull out." Yorkomatic H.G.D. coolers are available in a range of six sizes for cold stores from 50 cu. ft. and upwards. The defrosting cycle is controlled by a time clock and at predetermined intervals diverts the hot gas from the compressor direct to the cooling coil which is freed from ice and frost. The system automatically returns to normal refrigeration cycle as soon as defrosting is completed.

EVEREST-LIEBHERR AGREEMENT

A merger with one of Germany's largest refrigerator makers has been negotiated by Merseyside Engineering (Refrigeration) the company marketing Everest refrigerators.

More than a million pounds is to be spent on factories in Liverpool, North Wales and Scotland, and the German group, Hans Liebherr, has eight factories in Germany and others in Ireland and Johannesburg.

Everest publicity will cost more than £100,000 this year, and the company expects to be one of the largest British suppliers to wholesalers.

The German deal is through Liholding Limited Liability Co., Zurich, and joint managing directors are C. A. Angelis and T. F. Wisslicen. A. W. Sinclair is sales director.

SIGMA ON BRITISH MARKET

The Sigma range of domestic refrigerators is now being distributed in the United Kingdom by Electro Appliances and Equipment Ltd., Mitre House, 177 Regent Street, London, W.1. Three models are available: A 5.8 cu. ft. model, retailing at 81 gns.; a 5 cu. ft. table top model, at 69 gns.; and a 4 cu. ft. model, at 63 gns.

LEISURE REFRIGERATOR LAUNCHED

A new freezer-refrigerator of 5½ cu. ft. capacity which retails at 75 gns., has been launched by Allied Ironfounders Ltd., Orchard House, Orchard Street, London, W.1. This model, known as the "Leisure," incorporates a Tecumseh unit.

DORSET RE-ENTER MARKET

An absorption type table top refrigerator of 2¼ cu. ft. capacity marks the re-entry of the Dorset Refrigeration Co. Ltd. into the domestic home market. The absorption unit carries a 5-year guarantee and the model retails at £52 3s. 7d.

Boston Frozen Foods Ltd.'s premises have a pleasant rural atmosphere, left. Below, members of A.F.F.S. at the firm's poultry plant.

Zero Store Men Visit Boston Plant

THE summer meeting of The Association of Frozen Food Stores was held at The White Hart Hotel, Boston, Lincolnshire, under the chairmanship of Mr. E. M. Major-Lucas, Northampton. Those present were Mr. A. Battley, Spalding, Major E. H. Bonnett, Newbury, Mr. R. A. Guest, London, who was voted into membership, Mr. T. R. Mayes, Northampton, Mr. J. T. Newington and Mr. S. T. Newington, Boston, Mr. A. Wagstaffe, Ramsey, Mr. T. F. Whitehead, Downham Market, and a representative from Refrigeration Press Ltd.

Current trade matters were discussed in an informal manner, this being a most attractive feature of this little quarterly gathering. Although members are, in effect, competitors, they give freely of their experience for the good of all.

The chairman reported that he had been approached by the magazine *Woman's Realm* regarding the activities of the Association, particularly as it related to locker plants and their appeal to housewives. On the basis of information which he and Mr. B. H. Davis, Cambridge, had given a useful article had been published in the above-mentioned journal.

The next meeting was fixed for Monday, October 10th, and Mr. P. Baker, Guildford, was to be asked if the venue could be in his city.

Members then moved to the edge of the town and were made welcome at Boston Frozen Foods Ltd., of which company Mr. J. T. Newington is managing director. This poultry processing plant and distribution centre is a fast-expanding concern and many developments were noticed since the last visit, including a processing line which was operating at 1,500 birds per hour ; weekly output of oven-ready birds at the moment is 35,000 and production is still rising. Cold storage space has been extended and further building only awaits the arrival of bricks.

OBITUARY

Mr. S. K. McGovarin

IT is with deep regret that we have to record that Mr. S. K. McGovarin, managing director of McGovarin Refrigerators Limited of London, passed away on June 28. He had suffered from poor health for some considerable time and during the course of the past few years he had been a patient in Nuffield House, Guy's Hospital, on two or three occasions.

Although Mr. McGovarin's business activities had necessarily been very restricted during recent years, his unique personality will undoubtedly be missed throughout the trade.

Mr. G. A. Arnold, the late Mr. McGovarin's co-director, had been associated with Mr. McGovarin since 1943 when the business was established and it is his, and was also Mr. McGovarin's, sincere desire that the business should continue in an eventuality such as this.

175th. Anniversary of J. & E. Hall Ltd.

FORTHCOMING RETIREMENT OF LORD DUDLEY GORDON

THE proud record of J. & E. Hall Ltd. of Dartford in attaining last month the 175th anniversary of their establishment is equalled by only a very few industrial houses in this country —and certainly by no other in the refrigeration field.

This milestone in the firm's history was marked on the 9th ultimo at their annual sports day at Dartford when the chief guest was Sir William Currie, G.B.E., head of the Peninsular and Oriental Steam Navigation Company.

The event was also made the occasion for declaring open the fine new Patterson Pavilion, the sports and social centre created to perpetuate the memory of the late managing director of the firm, Mr. V. A. Patterson.

Lord and Lady Gordon received the many guests.

There is no need to reproduce here the remarkable history of this great Hall enterprise for it is so admirably recorded in the souvenir edition of the *Hallford Magazine*. It is interesting to set down, however, an extract from the late Mr. Everard Hesketh's speech on the occasion of the 150th anniversary in June, 1935 :—" In 1885 I took part in Hall's centenary celebration held in my own grounds on Dartford Heath. Again in 1910 I took part in their 125th birthday, celebrated then in Hesketh Park, and now, once more, in 1935 I am taking part in their 150th birthday.

" It is not humanly possible for me to take part in their next celebration in 1960, and yet I hope with all my heart that when the time comes this great business, which I love so well, and to which I have been privileged to devote the whole services of my long life, will not only have retained its present position but will stand higher than ever amongst the great industrial enterprises of the world. I believe that it can and will do so provided it worthily upholds the good traditions which it has built up in past years.

" The struggles of the past have been severe and those of the future will be no less so, but if each one gives of his best for the benefit of the whole we need have no fear for the future prosperity of the firm."

As readers may judge, these hopes and aspirations have been fulfilled.

Writing on the occasion of last month's celebration, the chairman, Lieut.-Colonel, Lord Dudley Gordon, D.S.O., LL.D., M.I.MECH.E., said :—" The 9th July, 1960 was chosen to celebrate the 175th birthday of J. & E. Hall. This is the third celebration in which I have been privileged to take part, the first two, 1910 and 1935, being in company with Mr. Hesketh. Just as he could not expect to take part in the 1960 celebrations, so I cannot expect to in 1985.

" The good traditions which Mr. Hesketh did so much to found have continued to fulfil his hopes and wishes. So to-day we are justified in looking forward with confidence to the future.

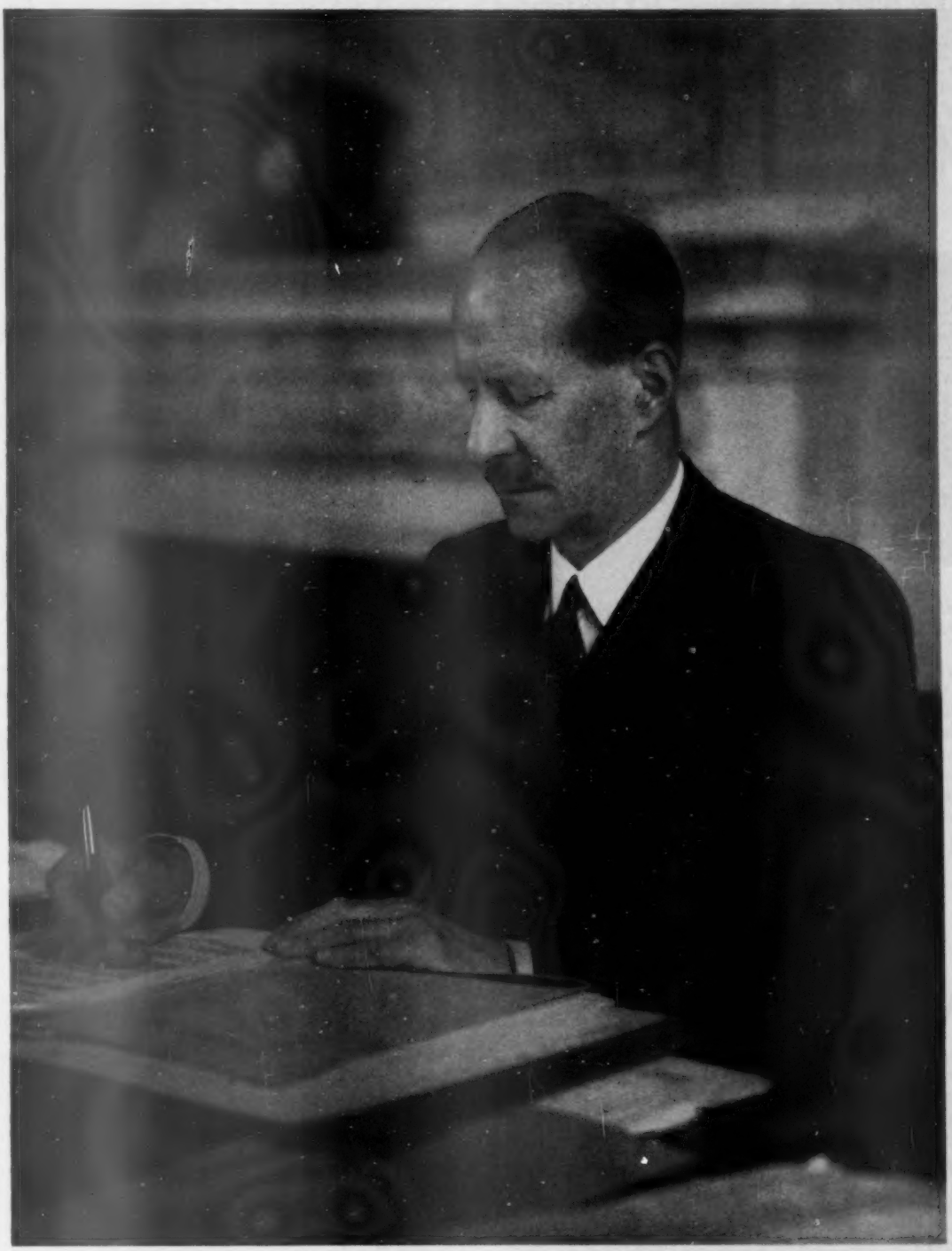
" The works continue to expand on the original site to meet the demand for all that is manufactured here. But above all, the extended sports ground and new ' Patterson Pavilion ' are signs of the continued good fellowship and pride in achievement which we inherit from those who went before us.

" Hallites all over the world can feel they are part of this great fellowship with its fine future prospects."

The recent announcement that Lord Dudley Gordon will retire in September, will remove from our industry one of its most illustrious and most respected leaders.

Born in 1883, the second son of the seventh Earl, and later first Marquess of Aberdeen, Colonel Gordon was educated at Cargifield, Edinburgh, and at Harrow. On leaving Harrow in 1902, though he had taken the appropriate examinations for going up to Cambridge, he went direct to Hall Russell's shipyard at Aberdeen where he served in the various departments in that organization including the drawing office, for a period of three years. It may be of interest to mention that at that time he was a member of a trade's union " The Shipwrights' Society." In 1905 he went to W. H. Allen, Sons & Co. of Bedford where he was a pupil for 18 months and went through the usual engineering departments and was afterwards, for a short time, employed on the technical staff.

It was in August, 1907, that Colonel Gordon joined J. & E. Hall Ltd., where again he had a period of training in the shops and on outside erection work, both in various shipyards and in land work. He became a member of the staff of the company in 1909 and a director in 1910. At that time he took charge of the land refrigeration section of the business and in 1912 became an executive director. From 1914 to 1918 he served in France and Belgium with the Gordon Highlanders, was awarded the



Lieut.-Colonel Lord Dudley G. Gordon, D.S.O., LI.D., M.I.Mech.E., is retiring from the office of chairman and director of J. and E. Hall Limited, and of president of Hall-Thermotank Limited on September 30. Some biographical notes on his illustrious career appear on the opposite page.

D.S.O. in 1917, and commanded the 8/10th battalion of that regiment. He became chairman of the company, in succession to the late Mr. H. J. Ward, in 1936 and continued in charge of the land work until 1945, when his other activities made it necessary for him to give up control of this section of the business while retaining the chairmanship of the company.

He was appointed a director of Hadfield's in 1943 and succeeded Sir Peter Brown as chairman in July, 1945. He is also a director of Industrial & Commercial Finance Corporation Ltd., Jacques Orchestra Ltd., and Phoenix Assurance Co. Ltd., and chairman of Millspaugh Ltd. He resigned from the board of Barclays Bank in January, 1958.

Lord Dudley Gordon is the only industry leader who has been president of The Institute of Refrigeration on two—widely separated—occasions, presiding over the then British Association of Refrigeration from 1926–29, and returning as president of The Institute of Refrigeration in 1955–57. He was president of the British Engineers' Association, 1936–39 and president of the Federation of British Industries, 1940–42. He was elected a member of council of the Institution of Mechanical Engineers in 1940 and a vice-president in 1944 and serving as president in its centenary year of 1947. He was president of the engineering section of the British Association in 1953, and a member of council of the National Production Advisory Council for Industry, 1940–56.

Among the host of other positions which Lord Dudley Gordon has filled or is filling may be mentioned :—Deputy-chairman of governors of Harrow School, chairman of committee of The Bach Choir, member of grand council and chairman of finance committee, Federation of British Industries, chairman of Air and River Pollution committee, member of executive committee, British Iron and Steel Federation, president British Iron and Steel Research Association, chairman of Refrigeration Industry Standards Committee of the British Standards Institution, president of the Highland Society of London.

The Patterson Pavilion at Hall's Sports Ground.

Fan for Display Cabinets

A NEW version of their successful " Wafter " fan unit, which can be used in refrigeration display cabinets and also dairies, kitchens, larders and many other confined spaces, is now being produced by Plannair Limited. The new " Wafter " moves 50 c.f.m. of air under free intake and discharge conditions, and its silent running 2,600 r.p.m. motor has a power consumption of only 12 watts. Total weight is less than one pound and the overall diameter only 3¼ in.

Plannair have designed the " Wafter " for an indefinite life without maintenance. It is robustly constructed, incorporating a moulded glass fibre impeller to withstand the heavy use experienced in domestic applications. The unit can also be attached to the wall and other surfaces. Suitable fittings are available. The location of the " Wafter " within a room depends upon whether air extraction is required generally, or from a specific point. In kitchens, for example, for general air extraction it could be situated in a window. In applications where air extraction is from a point away from an exterior wall, trunking to remove extracted air to the outside of the building is required.

There are three units, the 3 PLW 101-401, 3 PL 101-407 and 3 PL 101–409, varying in the type of housing fitted. Each has a performance of 50 c.f.m. under free air conditions reducing to 26 c.f.m. at 0·1 in. s.w.g. Power input is 12 watts. The motor running at approximately 2,600 r.p.m. is a shaded pole type with dual windings for 115 volts or 230 volts, single phase, 50 cycles. Ambient temperature range -20° to +85° C. Construction generally to M.O.S. Specification 1086 B, the shaft being of stainless steel running in sintered bronze self-lubricated bearings. Oil used Aeroshell 12 fluid complying with DTD 822. The impeller is constructed from moulded fibre glass. A four-point fixing is available for the 3 PLW 101-401 unit in the form of an anodized shaped cowling in light alloy.

KELVINATOR'S *Fully-mechanized* PLANT

The "4·6 c.ft. to 9·4 c.ft." Matched Series now Coming off Bromborough Line in Large Numbers

1. 100 per cent. visual and dimensional inspection on all sealed compressor parts.

2. Sealed compressors being packed for export shipment—this consignment for Colombia.

3. 300-ton hydraulic brake press flanging cabinet shells.

HAVING seen what an impact the new square-cut Kelvinator domestic refrigerators have made on the market since their introduction last November, " M.R." recently visited the Bromborough plant in Cheshire where these models, and other packaged commercial units, are manufactured—to learn the secret of this success story.

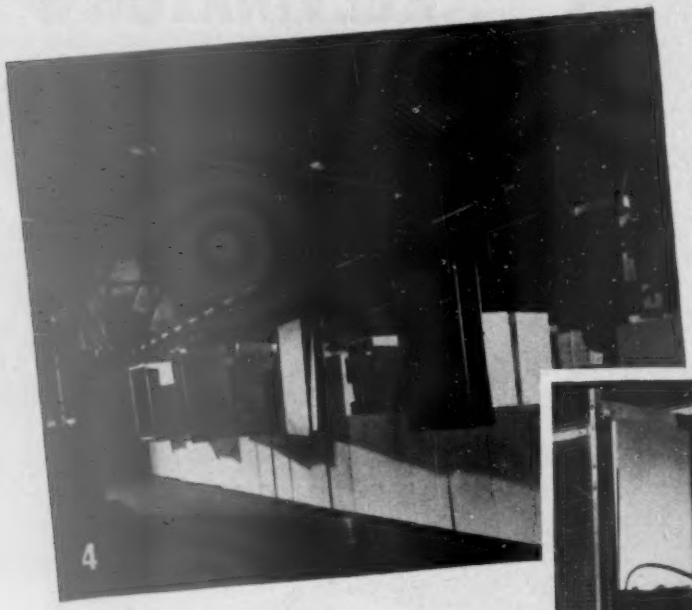
Readers will recall that the factory at Crewe (which Bromborough replaced) was equipped during the immediate post-war years and a large scale manufacturing programme put Kelvinator among the biggest exporters of domestic and packaged commercial cabinets. After a major fire, the company already

allocated the largest post-war factory built by the Government, re-established the factory 28 miles away at Bromborough.

Besides the range of domestic refrigerators the company supply a large proportion of the beverage-cooling cabinets used in this country as well as a range of ice cream and frozen food merchandizers and a range of condensing units for commercial applications. The factory employs 1,500 hands, and occupies an area of approximately 300,000 sq. ft. and a further 18 acres is available on the site for future development.

Immediately upon entering this factory it is clear to the visitor that this vast area has been planned with the present, and even higher rates of production in mind, for the smooth flow of products is quickly noticeable, from the time that the Summers' steel is picked up by a ten-ton traversing crane to move it to the cutting bays. It is bright steel stapelized to prevent distortion. The steel for the cabinets travels to the pressing shop, where the various sides, doors and other metal parts are stamped out. The equipment here varies from a towering 500-ton press by Fawcett and Preston, a nearby engineering firm, to a number of "small" five-ton machines. In all there are 25 presses.

Most impressive is the paint shop, already mentioned in these columns,



4. Service conveyor transporting parts from weld shop to paint shop and thence to assembly line.

5. Special purpose air operated "U" former for domestic cabinet shells.

6. Vacuum formed 6 c.ft. interior liner produced from female mould.

which is believed to be the largest used in the domestic appliance industry in this country and possibly in Europe.

Of the full Kelvinator range—4·6, 6·0, 7·7, 9·4, 10, 13, 18 c.ft.—all but the three largest models are made at Bromborough, the other three being imported from the United States.

It is understood that Kelvinators can claim that the highest proportion of their production was exported of any U.K. maker in the past six months.

★

8. Final inspection and start of packing of domestic cabinets.

7. Completed conservators and merchandizers awaiting despatch.

★

9. 13 c.ft. combined refrigerator and deep-freeze, part of prize winning exhibit at this year's Cheshire Show.

Refrigerated Transport in Nairobi

Vespa commercial vehicle refrigerated with a ¾-h.p. Hall condensing unit.

A. BAUMANN & Co. (East Africa) Ltd,. for many years readers of "M.R." in Nairobi, have recently informed us of some refrigerated body-building work they have undertaken. They are agents for J. & E. Hall Ltd. of Dartford.

The smallest installation Baumann's have carried out is the conversion of a standard three-wheel Vespa commercial vehicle for the local delivery of ice cream. This body has been insulated with 2 in. of cork slab. There is a ¾ h.p. J. & E. Hall condensing unit mounted on the roof, which is piped up to a hold-over plate situated horizontally in the middle of the van and this also acts as a full-width shelf. There are also copper evaporator coils mounted just under the roof of the vehicle for a quick initial pull-down of the internal temperature. Cork insulation was used in preference to one of the lighter expanded polystyrenes, so that the cork's weight would also give a measure of hold-over.

In practice, the internal temperature is brought down to minus 5° F. and after its disconnection from the electric mains, an internal temperature is kept at 0° F. for approximately three to four hours, with the access door being opened approximately eight times per hour. On returning to the depot for reloading, it only takes approximately one hour to return the eutectic to a solidified state. From the photographs it will be seen that the roof mounted condensing unit is housed within a sheet steel cover with ample louvred area for the dissipation of hot air from the air cooled condenser.

Baumann's client finds that these Vespa refrigerated vans, which call for only a low initial capital investment, are ideal for up to 15 miles delivery radius, especially in Nairobi's very congested streets with difficult car parking.

Baumann's largest refrigerated vehicle contracts were carried out on Leyland Octopus, eight-wheel chassis for the transport of any type of produce down to 0° F. These lorries were required to transport perishable foods from Mombasa on the Kenya Coast, through Uganda to Stanleyville in the Belgian Congo, and from Nairobi in Kenya through Tanganyika to Rhodesia. These journeys take anything up to 10 days according to the state of the appalling roads that are encountered in this part of Africa. The bodies are insulated with 6 in. thickness of Rocksil finished internally with galvanized sheet metal.

The J. & E. Hall refrigeration plant consists of

(*continued on page* 830)

This Leyland Octopus lorry, which is cooled with a Hall 3C7 air-cooled condensing unit, is required to undertake journeys of up to 10 days from one part of Africa to another.

The Institute of Refrigeration Bulletin

Institute Headquarters: New Bridge Street House, New Bridge St., London, E.C.4 (CENtral 4694)

EVENING CLASSES IN REFRIGERATION, 1960-61

Evening classes in refrigeration will shortly be commencing at technical colleges in various parts of the country. These classes cover two distinct courses of study. One of the courses, that for the City and Guilds of London Institute syllabus No. 73, in the Science and Technology of Refrigeration, is intended for the student who wishes to obtain a professional qualification and to qualify for corporate membership of the Institute; certain pre-entry qualifications are required by persons enrolling for this course. The other course, for the City and Guilds syllabus No. 72, in Refrigeration Practice, is primarily designed for students who desire to become qualified as refrigeration servicemen.

The Science and Technology of Refrigeration

Evening classes in the Science and Technology of Refrigeration will commence at the National College for Heating, Ventilating, Refrigeration and Fan Engineering, Borough Polytechnic, Borough Road, London, S.E.1, towards the end of September. The course, which extends for two years, is in preparation for the City and Guilds of London Institute syllabus No. 73, which is the examination for corporate membership of the Institute of Refrigeration. Intending students must be over 21 years of age and should hold the Ordinary National Certificate in Mechanical Engineering (including Applied Heat or Heat and Heat Engines) or an equivalent qualification.

The college will be open from 5.30 to 8 on the evenings of September 19 and 20 for the enrolment of students for evening courses. The director and members of the staff will be present on each evening to advise students on suitable courses of instruction. The fee for students residing within the administrative County of London and most of the adjoining counties is £2 10s. for an evening course consisting of two or three evenings a week. In some cases, students who reside outside the administrative County of London will be required to furnish vouchers from their local education authority. Particulars may be obtained on application to the secretary of the college. The governors require all part-time students to pay a fee of 1s. 6d. a year for membership of the Borough Polytechnic.

Refrigeration Practice

It is believed that courses in Refrigeration Practice, in preparation for the City and Guilds of London Institute syllabus No. 72, are to be held at the following colleges :—

Willesden Technical College.
Llandaff Technical College.
Bognor Regis Technical College.
Nottingham, People's College of Further Education.
Southampton Technical College.
Port Talbot College of Further Education.
Stowe College, Glasgow.
Dublin Technical College.

Enquiries concerning these courses should be made to the principals of the colleges.

It is possible that courses would be arranged at other technical colleges provided there was sufficient local demand.

COMMONWEALTH TECHNICAL TRAINING WEEK

Commonwealth Technical Training Week is being held throughout the Commonwealth in 1961, the dates for the United Kingdom being May 29 to June 4, inclusive.

The aim of the Week is to impress on all sections of the community the importance of the education and training of young people for employment.

The organization of the Week is in the hands of local authorities, and a booklet " Training Today for Tomorrow," outlining the objects of the Week and suggesting various activities is being widely distributed not only to the local authorities but also to those concerned in industry and education.

Copies of the booklet may be obtained from the City and Guilds of London Institute, 76 Portland Square, London, W.1., which has undertaken responsibility for the project at the request of the President, H.R.H. The Prince Philip, Duke of Edinburgh.

BRITISH STANDARDS

Bourdon tube pressure and vacuum gauges— B.S. 1780 : 1960

Prepared by a committee of experts, this new publication (60 pp., 18 illustrations) specifies requirements for indicating pressure gauges, vacuum gauges and combined pressure and vacuum gauges of the bourdon tube type. The range of nominal sizes is 2 to 12 in.; and the maximum scale readings are up to 16,000 lb. per sq. in. or up to 6 tons per sq. in.

Requirements are specified for test gauges with

concentric scales and for industrial gauges with concentric and eccentric scales. The standard gives a range of sizes for direct mounting and surface mounting gauges; and a series of standard pressure ranges and scale graduations.

Among the seven sections of the comprehensive volume are those dealing with: materials and construction; dimensions; accuracy; testing and inspection; marking and packaging. Buyers and suppliers will find particularly useful the list of 18 items of information which should be embodied in an order.

Helpful appendices

The new standard concludes with 9 appendices. Typical titles are "Notes on testing apparatus and methods" and "Recommendations on the installation and use of gauges."

Copies of this standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1. Price 15s. (Postage will be charged extra to non-subscribers.)

LIGHTFOOT MEDAL

On the recommendation of the Papers Committee, the Executive Council has decided to award the Lightfoot Medal for the best paper presented during the 1959-60 session to Mr. J. M. Buist, B.SC., Associate Member, and Mr. R. Hurd, B.SC., for their paper entitled "Polyurethane Foams: Their Contribution to Heat Insulation," which they read at the meeting of the Institute held on February 4, 1960.

INSTITUTE COMMITTEES, 1960-61

The membership of the Institute committees for the current year is :—

Education Committee

G. L. H. Bird, B.SC.—*chairman*

C. M. Brain
J. H. Brier
K. J. R. Cocke, B.SC.
T. E. M. Douglas, B.A.
W. S. Douglas, B.SC.
J. C. Fidler, O.B.E., B.SC., PH.D.
W. B. Gosney, B.SC.
E. M. Heap, M.ENG.
G. Yate Pitts, M.ENG.
D. R. Scott, M.SC., PH.D.
W. R. Sinclair, B.ENG.
J. C. Taylor

Membership Committee

H. Randal Steward, T.D., B.SC.—*chairman*

K. R. Billinge
J. H. Brier
E. W. Burman
J. Douglas, B.SC.
R. W. Griffin, B.SC.
A. C. Murdoch, B.SC.
G. Yate Pitts, M.ENG.
J. A. Stonebanks
J. C. Taylor

Papers Committee

W. B. Gosney, B.SC.—*chairman*

A. S. Alison
A. J. Barnard, B.SC., PH.D.
W. S. Douglas, B.SC.
J. C. Fidler, O.B.E., B.SC., PH.D.
K. C. Hales, M.A.
L. R. Meyer
A. C. Murdoch, B.SC.
B. C. Oldham
R. R. Poole, B.SC.
T. Telfer, B.SC.
S. B. Turner

Research Committee

Ezer Griffiths, O.B.E., D.SC., F.R.S.—*chairman*

G. L. H. Bird, B.SC.
C. M. Brain
J. Douglas, B.SC.
W. S. Douglas, B.SC.
J. C. Fidler, O.B.E., B.SC., PH.D.
W. B. Gosney, B.SC.
K. C. Hales, M.A.
G. G. Haselden, B.SC., PH.D.
E. M. Heap, M.ENG.
W. R. Sinclair, B.ENG.
J. A. Stonebanks
T. Telfer, B.SC.

Finance Committee

W. R. Sinclair, B.ENG.—*chairman*

W. S. Douglas, B.SC.
H. G. Jaeger
T. A. Raymond
H. Randal Steward, T.D., B.SC.

Air-Conditioning in Cars

SOME factors relating to the choice of air-conditioning equipment for cars, were analysed in the U.S. recently by Mr. W. H. Jackson, of the General Motors Corporation. He was reading a paper entitled "the bodies in which we live" before a meeting of the Society of Automotive Engineers.

For ambient temperatures from 0° to 70° F., the heater outlet temperature should vary from 160° to 70° F. To provide adequate heat under severe ambient conditions, and rapid warming of internal surfaces, a maximum of 25,000 B.t.u. per hour is required. Discharge of the heated air should be at or near floor level. The rising hot air gives good heat distribution throughout the car and the initial discharge around the legs and feet (the least clothed and lowest skin temperature portions of the body) provides a psychological warming effect during the early stages following starting. Discharge of hot air towards the face would be undesirable, as it would dry out the mucous membranes of the nose and throat, causing discomfort.

In warm weather, cooling can be achieved by letting air at ambient temperature flow over the skin surfaces. The process can be rendered more efficient if the air is cooled.

Skin temperature is the most important influence on heat transfer rates to and from the body. In general, 44 per cent. of body heat is lost by radiation to colder surfaces, 32 per cent. is lost by convection to the air from the skin and mucous surfaces of the nose and throat, and 21 per cent. is lost by evaporation from the skin and the same mucous surfaces. The remaining 3 per cent. is used for warming food and for various digestive processes. A thermally comfortable individual might have skin temperatures of 80° F. at the toes, 90° F. at the upper legs and arms, 95° F. at the forehead, and a constant deep body temperature of about 100° F. Once the skin temperature reaches 95° F., however, the entire body surface tends to stabilize at this value as ambient temperatures increase.

Car ventilation operates usefully at ambient temperatures between 60° and 100° F. The cooling achieved depends on the evaporative heat loss from the passengers resulting from the impingement of air at velocities between 50 and 1,100 ft. per minute. For ventilation purposes an air flow of 500 c.ft. per minute is quoted by Mr. Jackson as being the optimum, compared with 150 c.ft. per minute for heating and 250 c.ft. per minute for air-conditioning. Naturally, air humidity greatly influences the cooling effect of the air flow, but this is not controlled unless refrigeration is present.

Ideally, ventilating air should flow over the occupants in an upward direction direct from the feet, with higher velocities on the feet and lap. Air speed should be reduced at chest level and should be very low at the face. If air is brought in below the instrument panel and exhausted through controlled ventilators and windows at about shoulder level, a good approximation to the ideal distribution can be achieved. In addition a relatively small quantity of air should be delivered to the front floor of the car to provide foot cooling and to counteract the radiation of heat from the dashboard, toe pan and floor pan tp the lower legs and feet. Parts of the body warmed by the rays of the sun require distribution of air to them to increase the evaporative cooling effect and offset the radiative heat gain of the body.

SHOP REFRIGERATION NEWS

RETAIL REVIEW

Very Small Shops Very Super Markets

By Our Special Correspondent

AS a result of visiting the shop of Mr. and Mrs. King at Old Fletton, Peterborough last month, I have revised my sense of proportion and revived my enthusiasm for discovering how other people work out space problems in terms of dimensions and divisions and ratios of refrigerated display to floor area.

The question I imagine to have been asked by the proprietor of this shop is : " What is the maximum space that can advantageously be given up to refrigeration without impeding sales or causing undue congestion in this shop which measures approximately 12 ft. (frontage) by 14 ft. (depth) ? "

But he would also have had to explain that, in addition to normal stocks of groceries and provisions, and quick-frozen foods, his range of merchandise included confectionery (sweets and chocolates) and cigarettes, and that he also held an off-licence for the sale of beer. In fairness to the refrigeration expert who was to work out the problem, he would further explain that over-the-counter service was during busy periods often given by four people simultaneously.

Not really much scope for refrigeration at all, you might say. He can't sell quick-frozen foods without it, so we will take a low-temperature cabinet for granted : and better not make it more than 4 ft. long. The other perishables can all be shown in a 6-ft. long display cabinet running depthwise, and that still leaves a little space on the opposite side and across the back of the shop

Generous space for refrigeration in a small shop.

for serving ordinary groceries and ancillary items such as confectionery over the counter.

That seems to be a reasonable estimate for refrigerated space in a shop of that size. But here is what Mr. King is actually using : a Farmoor frozen food cabinet 6 ft. by 3 ft., a ¾ vision Bedford/Prestcold 6 ft. by 2 ft. 6 in. and a beer cooler 4 ft. by 2 ft., giving a total length of refrigeration of 16 ft. That must be among the records for refrigeration in small shops. All the cabinets were installed by The Bedford Refrigeration Co., Ltd. who also designed the non-refrigerated showcase (which runs across the back of the shop) to match the rest of their work.

Not quite so small, but narrow and presenting problems of a rather different kind, the shop of Mr. Darvill at Goldington, Bedford, is an equally interesting example of resourcefulness in planning for refrigerated display.

The cabinet for provisions and dairy goods is in line with the counter at the rear end of the shop and thus has to be passed by all customers who come in for groceries. It is not a standard product, but was designed to meet Mr. Darvill's requirements by The Bedford Refrigeration Co., Ltd.

It is, in my opinion, particularly worthy of study as a medium of display. Carried to a height of 4 ft. 2½ in., it has two display levels and the front glass is sloped at an angle which allows the customer of average height to see the whole of its contents without stooping, and even the tall customer has only to lean forward slightly. The result is that the display attracts the attention, not only of customers who are buying provisions, cooked meat, and the like, but also of those going to and coming from the grocery counter.

A double-deck display cabinet for effective display. The refrigerating machinery house, designed to match, provides support for the scales and slicing machine.

This is a vast improvement on so many of the average type of standard refrigerated display cabinets. Normally carried up to or a little above counter height, their front frames generally break the line of vision of the customer looking downward, and it is not possible to view anything displayed behind the sloping glass fronts without stepping back and stooping down. Seldom does one see a customer taking the trouble to do so, partly because the position is an ungainly one, and partly because in that crouching position they get in the way of other customers waiting to be served or trying to pass by.

The attention-attracting value of the ordinary type of glass front to any kind of cabinet, not excepting those for quick-frozen foods, depends very largely upon the position occupied. A good example of successful siting in this respect is the provision cabinet, which shown in the fourth illustration, was installed by J. & E. Hall Ltd. in the shop of A. G. Binding & Son at 68, Kenn Road, Clevedon, Somerset.

Another noteworthy feature of the installation in Mr. Darvill's shop at Goldington is the very attractively designed casing for the refrigerating machinery which immediately adjoins it. This compressor housing, finished exactly to match the cabinet, has a top of laminated plastic and provides a conveniently sited base for the slicing machine and the scales. The other cabinet seen on the left of the illustration and which backs on the window, is another Farmoor for quick-frozen foods

By way of extreme contrast to

Well-sited cabinet in a Somersetshire grocer's shop.

Two long runs of refrigerated display in a Fine Fare supermarket at Bedford.

small shop refrigeration, I am including illustrations of two impressive supermarket installations.

In the new town-centre which is being built at Bedford, Fine Fare Ltd. have opened a supermarket. Here there are two 24-ft. runs of refrigerated display. The continuous line of cabinets seen in the foreground of the fourth illustration consists of four 6-ft. long double-sided Prestcold cabinets ; the two centre ones being given up to frozen foods.

The other continuous line of cabinets runs parallel with the line just described and also with the long window on the return frontage of the store, through which the contents of the cabinets are easily seen. This run is refrigerated on one side only. This is another installation by The Bedford Refrigeration Co., Ltd.

A 24-ft. run of Hussmann "MD" meat case in the meat department of the latest Anthony Jackson Supermarket, Tooting.

"NO FROST" UPRIGHT FREEZER

A NEW type of upright freezer which maintains freezing temperature without coils on each shelf, has been developed by Kelvinator. The new 14-cu. ft. model has a cooling coil on the back wall of the cabinet. A small fan forces air through and around the coil and circulates the cold air throughout the cabinet, maintaining the freezing temperature but preventing the deposit of moisture on food packages and shelves. The cooling coil is concealed by an aluminium cover plate.

The new "no frost" freezer has a capacity of 490 pounds, with special storage conveniences in both the cabinet and the door. A roll-out basket at the bottom of the cabinet can be removed for easy loading, and is handy for bulky and heavy packages. It has four shelves, one of which is removable.

"Magic-store" door shelves provide easy and compact storage of food packages in five shelves. A vertical bar in the centre controls the horizontal shelf guards that keep packages in place. When loading, re-arranging or selecting from the shelves, the vertical bar is raised, holding the shelf guards in an "up" position. Below the "Magic-store" shelves is a juice can dispenser.

The new model has an interior floodlight and a safety signal light that glows constantly indicating

power is on and temperature is being maintained, plus adjustable level screws on the front feet of the cabinet, safety door latch and tumbler-type lock.

Kelvinator's upright freezer.

NEW LEC REFRIGERATOR

Latest model to be introduced by Lec Refrigeration Ltd. is the "Twelve/six" dual-temperature refrigerator-freezer. The top section of the "Twelve/six" has a capacity of 12 c.ft. of normal refrigeration space with four adjustable sliding shelves which enables produce in the back of the refrigerator to be reached with ease. The door is fitted with adjustable aluminium racks, a butter and cheese compartment to keep the butter at the right consistency for spreading, and ample storage space for large quart-size bottles.

The deep freezer is the lower compartment with a capacity of 6 c.ft. giving long-term storage space for 210 lb. of frozen foods. Both sections of the "Twelve/six" are fitted with all plastic white interiors which are hygienic and completely rust proof. The exterior finish is in white with a blue panel and chrome handles. Retail price is £179 10s. including service fee of £10.

STANDARD FOR ZERO CABINETS

● British Standard 3053, recently published, is for display cabinets operating in the "zero range" of internal temperature for use in temperate climates and was prepared under the supervision of the Refrigeration Industry Standards Committee, in response to a number of requests from user organizations. It prescribes requirements for construction, materials and finish, together with standard methods of calculating the net frozen storage volume and the net shelf area below the loading plane; this latter is defined with reference to the temperature above which the top layer of contents must not rise while the display cabinet is operating under specified conditions. It specifies certain tests to be carried out on all display cabinets together with others to be carried out on selected display cabinets. For the retail sale of frozen packaged foods at temperatures not exceeding +5° F. (–15° C.), for use in temperate climates only. The stringent requirements in this standard may cause heartburning in some quarters but can only result eventually in a strengthening of the British manufacturers' position.

A newly founded company, Frimatic GmbH with offices in Cologne, is to promote sales of French "Frimatic" refrigerators in West Germany. The new concern, with a capital fixed at DM. 170,000, is a wholly owned subsidiary of Frimatic, Camps & Cie., Paris.

* * *

The Empresa Nacional "Elcano" de la Marina Mercante, Spain, is reported to have received an order for the building of two 5,000-ton refrigerator ships for a Swiss concern. The cost of each ship is estimated at U.S. $2,700,000.

* * *

Two Australian dairy experts have been sent to Saigon under the Colombo Plan to install dairy equipment being supplied to Vietnam. A complete milk treatment and refrigeration plant, with generating plant, has arrived at Ben Cat experimental dairy farm, 35 miles from Saigon, established with Colombo Plan aid from Australia three years ago.

* * *

During a tour of Cap Von Province, Tunisia, from April 11 to 15, President Bourguiba opened plant for the Cap Bon refrigeration society.

* * *

Dollar-Rae Ltd. of Eglinton Street, Glasgow staged a how of shopfittings and refrigerated equipment at St. Ninian's Perth in the middle of June to allow presentation of equipment to retail traders in the area. Levin Refrigeration of Sweden was strongly featured in the event, all the latest models in the Levin range being on show. Considerable expansion has been achieved in the Levin organization in Scotland recently, with an increased sales force and expanded promotion, as the spearhead of a sales drive.

BOOK REVIEW

DIE ANWENDUNG DER KAELTE IN DER LEBENSMITTELINDUSTRIE. (Applications of Refrigeration in the Food Industries). By twelve co-authors. xix + 690 pp., 9¾ in. × 6½ in., with 308 illustrations and 108 tables in text. Springer-Verlag, Berlin, 1960. DM. 114.

This is Volume X of the "Handbuck der Kaeltetechnik" (Handbook of Refrigeration) of which Professor R. Plank is the general editor. It is a comprehensive work dealing solely with the conservation of foods in fresh condition by refrigeration in the many food industries. It is remarkable in view of the great economic significance that there are very few works of this type in world literature; books which deal with the general technology of foods must deal with all types of preparation and conservation and can only give refrigeration processes a relatively small space. In this tome refrigeration is the primary consideration throughout, and with its 12 co-authors who in addition to their own experience have drawn freely on the published work of no fewer than 1,400 workers of many nationalities, it represents the cream of human endeavour in the application of refrigerated processes to foods.

Refrigeration at "The Royal"

ONLY three major refrigeration firms took stand space at this year's show at Cambridge of The Royal Agricultural Society of England and Wales; these three reported good business when "M.R." called.

Prestcold exhibited two new models; both of these commercial refrigerators—a conservator and a food freezer—are being produced at the Company's new factory at Swansea. On show for the first time in England was Prestcold's new commercial food freezer, the F.F. 132. This is the second new model to emerge from Prestcold's new factory at Swansea which first came into production a few months ago. The F.F. 132 will hold over 400 pounds of closely packed produce and, under average conditions, will freeze 20/30 pounds of various kinds of foods in about six hours. Also on show was another newcomer to the Prestcold range—the C.C. 132 conservator. This was the first refrigerator to be made in Wales. A selection of service cabinets, low temperature conservators, deep freeze units, sales and display cabinets, the automatic ice-cube maker—and domestic refrigerators were

York Shipley Ltd. featured a 200 cu. ft. cold room with a model HGD 34 V Yorkomatic unit cooler with hot gas defrosting. Both the Icelet machine, which produces up to 220 lb. of icelets in 24 hours, together with the Ice-flake machine, which produces up to 250 lb. of ice per 24 hours, were shown together with a range of food storage and display cabinets. Two different types of in-churn milk coolers were spotted, together with a 13.3 cu. ft. farm freezer and a representative range of unit coolers. Other items included the recently announced transportable beer cellar cooler; air-cooled and water-cooled belt driven Refrigerant-12 condensing units and "Yorkometic" air-cooled and water-cooled hermetically sealed condensing units for Refrigerants 12 and 22.

J. & E. Hall Ltd. mounted an impressive display of refrigeration units and equipment for the farming and allied trades. The two Chillwell ice bank milk-cooling units, one with a capacity of 200 gal. per day and the other 75 gal. per day, attracted a lot of attention from the dairy farming community. The centre piece of the display was a flake ice making machine working continuously and producing approximately 1 ton of ice per day. Another interesting piece of equipment was a working scale model of an immersion conveyor type hydrocooler capable of dealing with vegetables in sacks or crates. Among the working exhibits was a standard 200-c.ft. cold chamber with polystyrene insulation and fitted with automatic electric defrosting equipment; display cabinets, a general purpose cabinet and a small cube ice making machine. One

Prestcold's centrepiece was a farm freezer.
Seen on York Shipley's stand were Mr. A. E. Philps, Y.S., northern area; Mr. F. W. Collom, manager, Y.S., southern area; Mr. B. H. Davis, frozen food store operator in Cambridge; Mr. W. J. Tomlin, Y.S., southern area; Mr. J. K. Goff, Y.S., commercial sales manager; and Mr. C. G. Smith, Y.S., London and export supervisor.
A feature of Hall's stand was the hydrocooler shown below.

R.S.A. NEWS

THE improvement of the serviceman's technical knowledge is an important by-law of the Refrigeration Servicemen's Association. With the approach of the winter session, members are reminded of this by-law and of the educational course. The sub-committee dealing with this course have already received many applications and enquiries. Nevertheless, to prevent disappointment to those who, in the summer rush of work and holidays, have forgotten to enrol, it is pointed out that there may be a possibility of delay for latecomers.

" Basic Refrigeration " by Guy R. King is the comprehensive text book to be used for this course. This is an American publication that has been ordered in anticipation of the demand. While it will be realized that sufficient quantity has been ordered against an anticipated demand, funds do not permit large stocks being carried by the association against large future enrolments. To take full opportunity of winter study, it is urged that application is made at once for copies of this text book to the hon. sec. or to Mr. W. G. Owen, the educational sub-committee chairman, c/o I, Crane Court, Fleet Street, London, E.C.4.

Much good work has been and is still being carried out by manufacturers in providing training courses for the servicemen of their distributors and agents. This has been stated in the past and in fact one of our lectures on the methods of training servicemen showed the useful quality of this training. Unfortunately the Association does not possess the room or facilities to conduct such a practical course. It is the practical experience coupled with technical knowledge that enables the serviceman to quickly and confidently diagnose the problems he encounters each day.

It is realized that experience takes longer to acquire than technical knowledge, but possession of the basic knowledge, that teaches how and why, enables practical experience to be more quickly acquired. It is this " know-how " possessed by the serviceman that is of inestimable value not only to the serviceman but to his employer.

This value is recognized by manufacturers who show it, as stated earlier, by conducting training courses. They cannot afford to have the good reputation they have built up for their product spoiled by inefficient servicing.

This value is also recognized by all in the association who are either taking steps to provide or to participate in acquiring this knowledge. Proof that this knowledge is needed is provided by enrolments from and overseas members.

Members are advised that the third winter session commences with the annual general meeting to be held on the last Wednesday of September, 1960. The date is the 28th. This will be followed as is usual by the first of the series of lectures on interesting subjects in refrigeration.

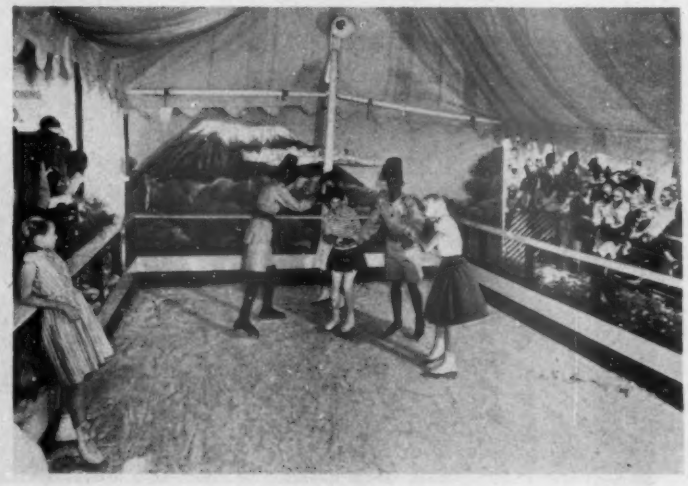
All interested in the activities of the association are invited to attend. Application forms for membership can be obtained from the hon. sec. at this meeting.

REFRIGERATED TRANSPORT IN NAIROBI

(*continued from page* 822)

one of their 3C7, air-cooled, condensing units fitted with both a three h.p. electric motor and a 7½ h.p., twin-cylinder, Lister diesel engine. There are six Winget hold-over plates installed, together with roof grids to give a flexibility for maintaining any required temperature.

The accompanying picture also shows an open air miniature ice rink Baumann's erected at the October, 1959, Royal Agricultural Society of Kenya's Show at Mitchell Park, Nairobi. Shade was provided for the ice by erecting an open-sided tent over the ice floor which was maintained with an atmospheric temperature on it of 86° F. One of J. & E. Hall's 6½ in. and 4 in by 4 in., two-stage, ammonia monobloc compressors, worked in conjunction with an air-cooled, ammonia, condenser cooling brine through a shell and tube evaporator, which brine was stored in an insulated tank. Brine was taken from this tank and pumped through pipe grids in the floor of the rink in the usual manner, which gave a nice firm ice without any melting, at the high ambient temperatures. Some 20 pairs of ice skating boots were imported, and most amusing performances were given by local Africans and Asians who had never seen ice before, let alone skate on it.

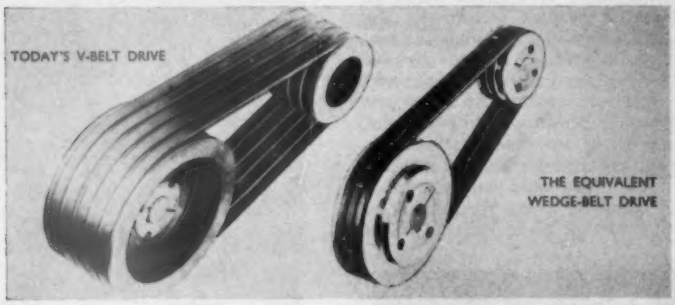


Many Africans and Asians saw ice for the first time when this miniature rink was erected at Kenya's recent R.A.S. show at Mitchell Park, Nairobi.

COMMERCIAL AND INDUSTRIAL SECTION

Manufacturers' and Distributors' News

What they describe as the greatest advance in drive design since 1930, the wedge-belt system, has been launched by **J. H. Fenner & Co. Ltd.,** Marfleet, Hull. The system, which is designated "SpacesaVer," consists fundamentally of increased efficiency in the transmission of power by belt and a corresponding reduction in the numbers of individual belts necessary for a given application. The much greater power capacity, states the company,



comes from the use of modern materials now available, combined with back-room work on the cross-section of the belt itself. SpacesaVer wedge-belts make full use of the strength and flexibility of terylene cords for pulling the load. These are encased in, and absolutely bonded to a synthetic rubber which gives great section stability, keeping the load-carrying cords exactly where they can do most work with least stress to themselves. The rubber used also gives bonus features of heat and oil resistance and adequate electrical conductivity. These have hitherto been the subject of surcharges. Along with the wedge-belts, new pulley designs take full advantage of modern controlled casting methods to give stronger, yet lighter pulleys. The range of belt lengths and pulley diameters has been selected on international standardization principles and an 80-page catalogue listing these (ref. 135/20) is available from the company. Sales commence on September 1, 1960.

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Two new appointments have been announced to the staff of Coventry Climax Engines Ltd.:—

Mr. Keith Higgins who has been appointed publicity officer, spent the period 1954-58 with Coventry Climax, leaving to join the publicity staffs of first Northern aluminium Company Ltd. and then Automotive Products Company Ltd., before returning to Coventry Climax on March 1, 1960. **Mr. Peter M. Jarvis,** who assumes the position of public relations assistant, joined Coventry Climax Engines Ltd. on June 27, from the Publicity Department of Ruston and Hornsby (Engineers) Ltd.

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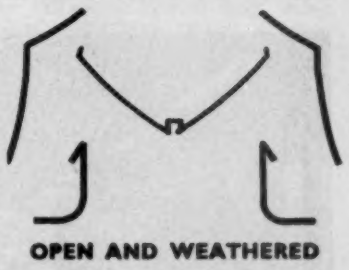
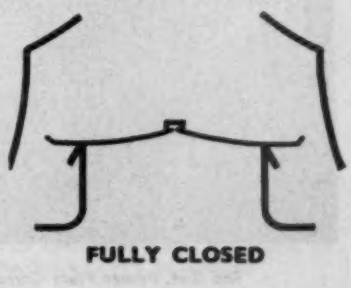
Ventilation in the average factory is normally designed to deal with summer conditions. A proportion of the ventilators, therefore, must always be closed up in the winter. **Colt Ventilation Limited,** Surbiton, Surrey, have recently introduced a new ventilator, called the O/S.R. Based on the same principles as the well-known Colt S.R., this ventilator, by simple cord control, can be opened up wide to the sky, thus increasing its extract capacity by approximately 50 per cent. By the use of the new Colt O/S.R. it is now possible to reduce costs. Fewer ventilators are required because the installation can be designed for average conditions whilst, at the same time, there is ample reserve of extract capacity to deal with hot summer conditions. For normal extraction the top cover-flaps rest on stops, giving complete weathering as in the S.R. ventilator. A pull of the control cord, however, lifts the flaps of the top cover into the vertical position, thus giving the ventilator a clear opening. When the flaps are dropped into the third position the ventilator is completely sealed. Like all Colt S.R. ventilators, the O/S.R. is designed on aerodynamic principles with aerofoil curves, which produce maximum positive extraction rates under all





conditions from the combined effects of stack action and wind. A new brochure of the S.R. ventilator, including details of the O/S.R. is now obtainable from the manufacturers.

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As already stated, the **G. M. Power Plant Company's** new showrooms at Ipswich were opened by Mr. Roy Mullin, vice-president sales of the D. W. Onan Company, Minneapolis, U.S.A. The D. W. Onan Company are the largest individual manufacturers of generating sets in the world and the G. M. Power Plant Company are their sole distributors in Great Britain and a number of near European territories. The new showrooms are devoted to the permanent display of almost all the Onan Company's products, together with Powerlite and Dieselite units manufactured by G. M. Power Plant and a range of Aqualite pumps which are also produced on their Ipswich assembly line, and Briggs & Stratton engines and other plant items. The units on display include stationary, portable and mobile generators for an immense variety of applications; as an indication of this field units are currently being supplied to builders, to the Post Office telephone engineering department, for mobile soft ice-cream vans and candyfloss machines, to river boards for fish stunning, to vehicle operators for mobile refrigeration, for mass X-ray, geophysical survey, to farmers, hatcheries and country houses for standby, to public address companies, police departments for radio, mobile film companies, ship and boat builders and overseas to organizations such as U.N.I.C.E.F. and in one case as far afield as Deception Island for the South Pole expedition. The association between G. M. Power Plant and the Onan Company goes back some 15 years.

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With the introduction of more and more automation into industry, any down time caused by failure of control systems can become excessively expensive. With complexity the size of the control gear increases and faults become more difficult to locate. While electro-mechanical relays are at present the least expensive method of handling the higher powers, they have the disadvantage that they are large, and they need some mechanical maintenance. To meet the need for small switching devices to replace electro-mechanical relays, the **Austin Motor Co.** in collaboration with **Hivac Ltd.** have introduced the Access system (Austin cold cathode electronic switching system). This uses cold cathode tubes to replace relays in the more complex sections of the equipment, while retaining electro-mechanical relays in the simpler higher current control sections and electro-mechanical power contactors in the main power handling sections, where faults are easier to find due to the less complex control in these sections. The cold cathode tubes used comprise a gas filled envelope having two or three internal metal electrodes. The tubes will not carry current until the voltage between two of the electrodes exceeds a certain fixed value. When a tube is carrying current, it gives an automatic self-indication in the form of a glow of light, so that the sequence of operations of control gear can easily be followed. It should perhaps be mentioned that since the cold cathode tube employs no heater, it is available for use instantly when switched on without the warm-up which is necessary with tubes having hot cathodes. The Donovan Electrical Co. Ltd., Birmingham 33, have acquired a licence to make and supply the system to any potential users.

* * *

Icemaster Ltd., Pierce Street, Queensferry, Chester, have introduced for general sale to the refrigeration trade a range of water-cooled hermetic refrigeration con-

densing units. This range extends from ½ h.p. through to 1½ h.p. Sternette Tecumseh motor compressors are utilized in their construction, and a unique feature is the fact the whilst they are extremely compact they are at the same time easily accessible. Units, which are available for use with "Arcton 12" and "Arcton 22" refrigerants, are normally supplied complete with water valve and high-pressure cut-out. Additional extras include a combined low- and high-pressure cut-out switch and in-line condensing water filter. The main advantages of water-cooled units over conventional air-cooled condensing units is the fact that with the water-cooled units there is no fan noise, they require limited ventilation, there is little heating of the room in which the condensing unit is installed, and they give a

The G.M. Power Plant Company's new showrooms at Ipswich.

greater capacity per electrical unit imput. In the case of cellar cooling installations the actual condensing unit can be situated in the same cellar it is cooling, the condensing water carrying the heat down the drain. These units will be produced in quantities at the firm's new factory which will have its official opening during September this year. The model illustrated is the H1SOW22A.

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A new type of flexible coupling which will provide dependable power and withstand all types of misalignment and end float, has been introduced by **R. & J. Dick Limited.** The coupling is claimed to have exceptional torsional flexibility—15° at peak torque compared to 1° to 3° for other types—and the ability to absorb vibration and shock thus resulting in smoother operation for both driver and driven equipment. A Quadriflex coupling is simple in design, consisting of two flanges and a two-piece flexible rubber sleeve. The teeth of the sleeve halves lock into the teeth of the flanges without clamps or screws and tighten under torque to provide smooth transmission of power. The coupling is easily installed and unaffected by abrasives, dirt or moisture. There is no metal to metal contact and the absence of wear eliminates the need for lubrication or maintenance. Operation is noiseless. As the name implies, the Quadriflex coupling is designed to provide all the four degrees of flexibility, angular misalignment up to 1°, parallel misalignment up to $\frac{1}{16}$-in. (depending upon shaft size), free end float up to $\frac{1}{8}$-in. (depending upon coupling size) and torsional load (vibrating, uneven and shock). No destructive overhung loads are placed upon driver or driven shafts thus assuring longer bearing and shaft life. Angular or parallel misalignment does not generate unbalance or pulsations for with Quadriflex couplings all the flexing takes place within the rubber sleeve. The couplings are designed to provide maximum operating safety. External finish is smooth and there are no protruding nuts or bolts to cause injury or catch on to clothing. The rubber sleeve acts as an electrical insulator between the driver and the driven unit.

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An indication of the extent to wh'ch at least one British refrigeration firm is going to assert the 100 per cent. British origin of its product in the face of increasing numbers of foreign models on the home market, is given by this Kelvinator label attached to all new refrigerators.

This refrigerated van, recently delivered to Drings, of Wembley, was built by W. & T. Robson Ltd. It incorporates a Lightfoot hermetically sealed air-cooled condensing unit housed over the driver's head. A Lightfoot P.C.4. wall cooler is mounted inside the compartment.

A new range of thermostats with the trade name " Klixon " has been developed by the **Metals and Controls Corporation,** Spencer Thermostat Division, Attleboro, Massachusetts, U.S.A. These thermostats are hermetically sealed units of which the operating element is a Spencer disc. This disc is dished in shape and operates by reversing its curvature according to temperature. In the position shown, the contacts are open ; a rise in temperature causes the disc to snap over to the opposite curvature and so close the contacts. By reversing the disc initially, the reverse action can be obtained. An alternative form is available which is more suitable for applications when the greatest vibration is to be expected with the contacts in the open position ; this has the moving arm operating upwards. Again, either normally open or normally closed contacts can be had. The units are hermetically sealed with the contact terminal posts passing through fused glass in the cap, which is soldered to the body. An insulating lining is fitted. The body is $\frac{5}{8}$ in. in diameter and the weight without mountings is 0·2 oz. Several forms of mounting are available. There are five models for operating in temperatures from –65° to +400° F. Temperature setting tolerances can be as small as 5° F. on both the opening and closing settings. The silicone rubber overmould, when used, has a temperature tolerance from –65° to +450° F. Electrical ratings are up to 7A (resistive), according to voltage and frequency.

* * *

From a series of tests made on detergent bottles produced from Rigidex polythene and copolymers, manufactured by **British Resin Products Ltd.,** it has been found that Rigidex Type 3 has the best long term resistance to stress cracking. Technical Note R.203, just issued by the company gives the results of recent work carried out in which five powerful detergents were stored for protracted periods both under normal conditions and at temperatures up to 70° C. It also discusses the effect of providing bottles with vented stoppers. Technical Note R.203 is available on request from the information department, British Resin Products Limited, Devonshire House, Piccadilly, London, W.1.

* * *

The Distillers Co. Ltd., Chemical Division, who are selling agents for British Hydrocarbon Chemicals Ltd., announce that they now have Cumene Hydroperoxide available for sale in commercial quantities. Despatch can be made in 5-gal. polyethylene containers or in 45-gal. polyethylene-lined drums from stock at Grangemouth. Sample quantities for evaluation, technical literature and price quotations are available from The Distillers Co. Ltd., Chemical Division, Devonshire House, Mayfair Place, Piccadilly, London, W.1 (MAYfair 8867), to whom all enquiries should be directed.

Chrysler International S.A. has appointed **J. Raven Ltd.**, of 43, London Road, Twickenham, Middlesex, to be its sole London distributors for Airtemp air-conditioning room units. This distributorship is backed by the full technical and sales promotion facilities of the Chrysler organization, which in London is based at Bowater House, Knightsbridge. Announcing the appointment, Mr. J. Raven, managing director of the company, said that it was their intention to operate an efficient technical sales promotion service in order to keep pace with the growing demand for air-conditioning from all categories of domestic, business and industrial classifications.

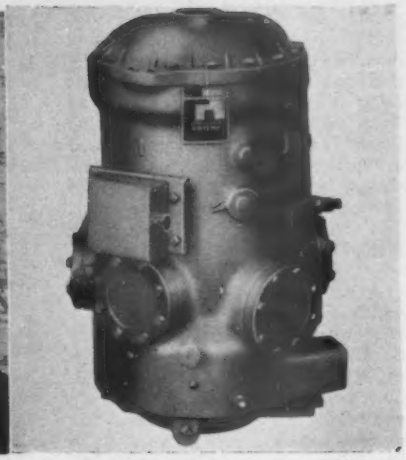
* * *

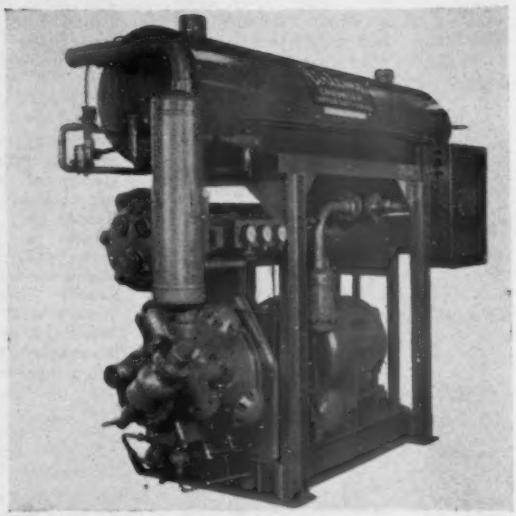
Mr. Willis Roxburgh, managing director of **Morphy-Richards (Astral) Ltd.**, has been appointed a member of the newly-formed Scottish Council's Committee of Inquiry into the Scottish Economy. The main function of this committee is to produce a reliable guide to the future industrial development of Scotland to enable positive steps to be taken in the reduction of unemployment. Mr. Roxburgh is one of the five full members appointed and will aid the Committee as a Scottish manufacturer of durable consumer goods.

* * *

Prestcold announce that the price of their famous "New Big Four" D.432 refrigerator is now reduced from £70 12s. 6d. to £66 3s. (63 gns.). The new price became effective on May 24. This reduction has been timed to coincide with the height of the selling season.

* * *



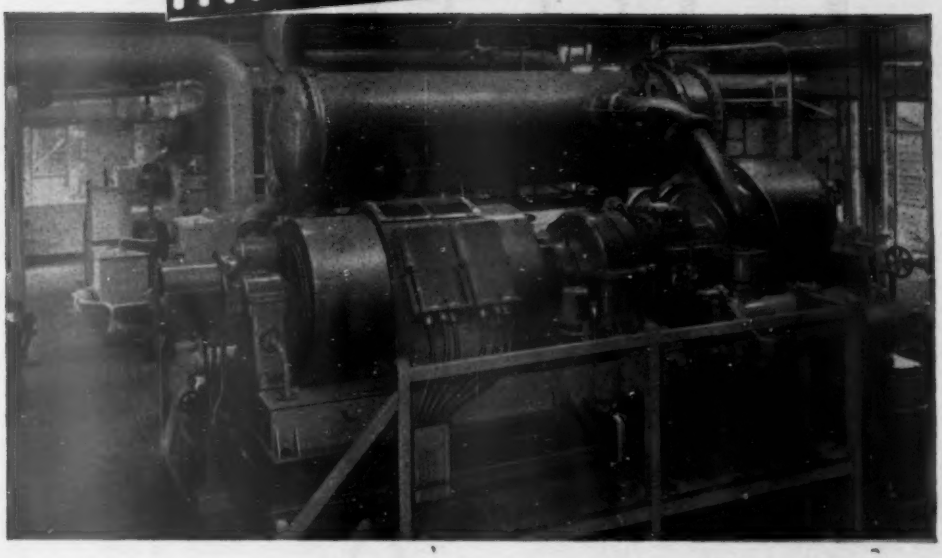


As announced last year in "Modern Refrigeration," Chrysler International, S.A., have entered the British refrigeration market. Above is Mr. W. K. Bradley, special products manager for the sterling area and Far East. Above right, a Chrysler 5-cylinder compressor is entirely sealed inside cast-iron crankcase to ensure long trouble-free operation. Right, head-on view of the Chrysler-Airtemp packaged liquid chiller which in single units or multiples, is capable of supplying chilled water for every type of central station air conditioning systems.

Mr. H. L. Bennett, whose appointment as United Kingdom manager of J. K. Levin, of Malmo, Sweden, is announced in this issue.

A visit was recently paid to West Germany by executives of Merseyside Engineering (Refrigeration) Ltd. and Bennett, Fielding & Co. Ltd. Main object of the trip was to see the Liebherr factory at Ochenhausen where "Everest" refrigerators are made. The English party are seen here with executives of the German firm.

1,350 TONS of REFRIGERATION for KODAK Ltd.



The illustration shows one of the three CENTRIFUGAL REFRIGERATING MACHINES supplied and installed by J. & E. Hall for the Harrow (Middlesex) Works of Kodak Ltd. They are used for controlling temperature and humidity during the processing of their products. With a total b.h.p. of 2150, the machines have an output of 16,200,000 B.t.u./h—equivalent to 1,350 tons of refrigeration!

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Refrigeration Requirements of Bread Bakeries

A NUMBER of advantages promise to make bread freezing an important technique in the wholesale baking industry. Used today on only a very limited scale, the method offers unique advantages in flavour improvement, in production scheduling, and in distribution range. This area therefore offers a significant potential growth market for the refrigeration industry.

In conventional baking, bread reaches the customer some 12 to 24 hours after it has left the oven. By that time, the staling process—which occurs most rapidly in the critical range—18° to 30° C.—is already well advanced so that the customer never gets to enjoy the fulsome flavour of truly fresh bread. By freezing bread immediately as it comes out of the oven, the critical temperature range of staling is quickly traversed and much of the original flavour is captured—with resulting competitive advantage to the producer.

There are other important advantages. Once frozen, bread retains optimum quality for a long time to permit distribution over much wider areas than would otherwise be possible. Furthermore, an inventory of bread may be built up to even out fluctuations in sales and to permit operation of the baking plant for five days per week, thus eliminating costly weekend and overtime labour costs.

Against these benefits stands the cost of freezing which continues to deter bakers from applying the method to a bulky, low-cost product such as bread. Experience of recent years has shown that this hesitancy is being overcome—often to good advantage.

First Large Installation

The first entries into the bread-freezing field were retail bakers, who found themselves compelled to adoption of the technique for reasons of production scheduling. Probably the first large commercial installation for bread-freezing at the bakery (as distinct from warehouse freezing) was the plant of Arnold Bakers, Inc., taken on stream at Port Chester, N.Y., in 1954. In this case, the frozen products were specialty breads (plus other baked goods) which sell at a premium price. But the work has proved to be trend-setting. Several other bread freezing plants were started in 1955 and the outlook is for considerable expansion in this field.

If carried out on a sufficiently large scale, book cost of bread refrigeration is reported to be less than 0·4 cents (approximately 0·3 pence) per lb. of product (1). This includes interest on investment, amortization, and operating costs.

Already more widespread is the practice of storing bread in commercial cold storage warehouses. According to Patridge, such practice calls for an average expenditure of one cent. (approximately 0·8 pence) per lb. product plus ½ cent. transportation. When compared with these charges, investment in a large captive bread freezing installation will be paid out in less than two years. This is quite aside from commercial advantages which will accrue from the flavour improvement achieved by immediate freezing.

It is important to bear in mind that bread freezing calls merely for an extension of refrigeration techniques which are already in widespread use in bakeries. Therefore, it calls for little, if any, added technical staff.

Thus, refrigeration methods are already in extensive use in the following phases of bread making.

Ingredient Storage

Refrigeration is required for quality retention in eggs. In bread making, this cooling requirement applies therefore only to specialty products.

Dough Ingredients and Mixing

Heat enters the mixing stage from three sources: temperature of ingredients, heat of flour hydration, and mechanical heat of mixing. Circulating water generally takes care of cooling requirements but there are instances where refrigerated brine must be used and where even the ingredient water is pre-cooled by mechanical refrigeration.

Fermentation and Retard Rooms

Careful temperature control is called for at these two stages. In fermentation, at 27° C. (81° F.) and 70 to 75 per cent. relative humidity, air conditioning is called for, especially during the summer months. To prevent rising of the dough which must be held for some time, a "retard" room is provided which is refrigerated to app. 1° C.

Storage of Waxed Wrappers

This calls for temperature control at 15° C. This is provided by refrigeration of the storage room.

To this list of major refrigeration applications in bread bakeries, is now added the freezing of bread immediately following the bakery process.

Pence and co-workers (2) have studied the effect of major variables in the bread freezing process on the quality of the product. The following conclusions were reached:

1. The age of bread at time of freezing has very significant effect on both firmness and taste of the product upon defrosting. Thus, bread which has been held for 11 hours prior to freezing was judged markedly inferior, on both counts, to bread which had been held for only four hours. This effect was persistent and was still observable even 48 hours after defrosting. Taste quality was evaluated by a taste panel. Firmness was determined by a standard baker compressimeter.

2. Both freezing and defrosting time should be short. A long freezing or defrosting time was found to result in marked increase in crumb firmness. Rapid freezing is the more important variable of the two, especially insofar as taste of the product is concerned. Indeed, flavour is affected but little by the defrosting time, but a freezing period not in excess of one-half hour is desirable. Of course, rapid freezing calls for costlier equipment, and the final decision as to control of this rate must be made

on the basis of economic compromise. Quick defrosting caused a decrease of about 3 per cent. in the moisture content of the bread's centre section while slow defrosting did not change the moisture content at all. It has been observed elsewhere that a difference in moisture content of as little as 2 per cent. influences the human judgement of freshness considerably.

3. Temperature in frozen storage should be between –18° and –12° C. This is the level at which changes in the bread's firmness and flavour occur so slowly that retention up to 46 days resulted in no significant deterioration. Obviously, storage below this temperature cannot be justified economically. At higher temperatures (even at –8° C.), the deterioration processes in bread are not sufficiently arrested to provide the full benefits of bread freezing in flavour and firmness retention.

4. Significant fluctuations in storage temperature are to be avoided. The adverse effect on firmness, flavour, and moisture distribution is greater than is observed when the bread is stored at a constant temperature which equals the average of the fluctuation range.

Effect of Contaminants

In planning a bread freezing room, it is important that the product be held completely separate of odorous or strongly flavoured materials since foreign tastes are easily acquired in storage.

These findings set the engineering specifications to which the freezing room must be designed : Rapid freezing, and a stable temperature between –12° and –18° C. Control of the last two variables is standard in refrigeration technique and warrants no special consideration in this place. On the other hand, the rate of freezing, being a dynamic feature, calls for experimental knowledge specific to the freezing of bread. Experimental data of importance in this problem have only very recently become available (3).

Most Important Variable

According to Pence (3), freezer temperature is the single most important variable in the freezing of wrapped bread. For unwrapped bread, which is of primary concern for the present discussion, major importance attaches to the velocity of air circulation through the freezer and to the position of the bread. Best results were obtained by using a low-temperature, high-velocity air blast at right angles to the long side of the bread loaf.

Pence points out further that wrapping lowers the required operating temperature by 5° to 6° C., if cooling is to be accomplished in the same time called for by unwrapped bread. The wrapping of bread prior to refrigeration thus introduces a very significant additional cost factor. At optimum conditions, a total freezing time of one-half hour was found to be quite feasible.

In general, the knowledge of bread freezing requirements and techniques has advanced sufficiently to permit immediate application in the plants. In many situations, the operating and competitive advantages which are clearly inherent in freezing are enough to pay out the cost of a refrigeration installation in short order. Certainly, the subject is active and evaluation of economic pro and con is indicated for a great many of the larger bread bakeries. The outlook is that bread freezing will prove enough of a boom to justify its widespread adoption during the next 5 to 10 years.

LITERATURE

(1) PATRIDGE, L. F., *Food Engineering*, September, 1955, pp. 73ff.

(2) PENCE, J. W., *et al*, *Food Technology*, October, 1955, pp. 495ff.

(3) PENCE, J. W., *et al*, *Food Technology*, July, 1955, pp. 342ff.

"SPACE" REFRIGERATOR

WHAT is claimed to be the world's first "space" refrigerator has successfully completed a simulated week-long mission into space. Designed and built by the Westinghouse new products laboratories in the U.S., the compact 1 c.ft. thermoelectric refrigerator was one of the key components of a manned capsule that housed a United States Air Force scientist on a seven-day test of the equipment man must have to live in space. The test was conducted at ARDC's Wright Air Development Division (WADD) Aerospace Medical Laboratory, Dayton, Ohio.

Designed to operate in the weightless environment or orbital flight, the refrigerator constitutes a complete food storage system. It was one of six life-sustaining devices sealed inside an airtight 9-ft. capsule resembling an Atlas (ICBM) missile nose cone. The equipment permitted Courtney A. Metzger, ARDC laboratory engineer and project co-ordinator, to remain inside the capsule during the extended test. Throughout his stay, Mr. Metzger's menu consisted of squeeze tubes of liquids ; semi-solids ; solids in diced portions ; some bit-size solids ; and an assortment of dehydrated, frozen and stable articles.

The refrigerator used in the test is composed of two main sections :—a chill area operating at 40° F. and a large freezer area operating at 0° F.

DAYLIGHT WITH VENTILATION

A WELL PRODUCED BOOKLET, "Daylight with Ventilation" has recently been issued by Pilkington Brothers Ltd., St. Helens, Lancashire. Written for the Company by Thomas A. Markus, M.A., M.Arch(M.I.T.), A.R.I.B.A., it describes, with the aid of photographs, diagrams and graphs, the many ways in which the double glazing can assist the architect. Aspects considered include heat transfer, humidity, sound insulation, light, economics and some modern methods of installation. Bases for calculation of some of the problems associated with double glazing are included and relevant formulæ outlined.

ELECTRICITY BOARD SALES

Sales of electric refrigerators by area electricity boards in England and Wales in the month ended May 31 totalled 22,513, a decrease of 26.3 per cent. over the corresponding period of 1959. Sales in the 12 months to May 31 amounted to 164,406, an increase of 47.8 per cent.

GAS REFRIGERATOR SALES

Sales of gas refrigerators during the 12 months ended March 1960 totalled 88,400 compared with 49,800 in the same period of 1959, an increase of 77.5 per cent.

Astral Equipment Ltd., Electrolux Ltd., R. & A. Main Ltd., and Radiation Group Sales Ltd., all showed refrigerators on their stands at the Royal Highland Show, Edinburgh, June 21 to 24.

1/670

Every schoolboy knows . . . that a thin layer of down gives more warmth than a whole mountain of compressed feathers. The technician expresses it in a different way: Still air is the best insulator.

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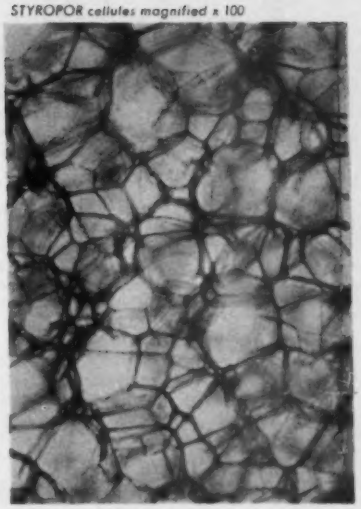
Apart from this, the material has further important advantages: it is feather light (density as low as 1.25 lb/cu ft), has a very low water absorption (doesn't ice up when used as heat insulation), good mechanical strength, is resistant to sea water, and is easily processed to mouldings of any desired shape.

STYROPOR foam is used for insulating cold storage rooms in breweries, milk centres, abbatoirs, cold stores, refrigerator vans, air conditioning plant, roofs, and chilling apparatus and pipes for carrying chilled liquids.

STYROPOR cellules magnified x 100



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'A PERIOD OF CONSIDERABLE ANXIETY'

—SACSIT President at Aberdeen A.G.M.

"TO-DAY, after 21 years of almost continuous negotiation with Government officials, the most serious single problem facing our national cold storage industry is the proposed method of disposal of the Government cold stores." This was the opening remark of Mr. James Mackenzie, president of the Scottish Association of Cold Storage and Ice Trades, at the association's 21st annual general meeting at Aberdeen on June 15. He went on:

"You are aware from the annual report and the bulletins that a number of meetings have been held in London between representatives of the cold storage industry and officials of the Ministry of Agriculture, Fisheries and Food to discuss the future of the remaining Government cold stores. When these 47 Government cold stores were built during the second world war, representatives of the industry were given repeated assurances that these cold stores would never be sold outside the industry. Many high sounding phrases and reassuring statements were made by persons in authority.

"I do not know whether such sales, if, and when they take place, will reduce the weight of the emergency stocks of food held in the safety of refrigeration in this country against any world emergency, and in this year 1960 more than ever before in world history, who can say what emergency to-morrow may bring?

"I do not wish to say any more to-day about Government cold stores because negotiations are actively in hand for further meetings but I do assure you that your committee are unanimous in endorsing the necessity for the continuance of the management company as presently constituted.

Large Investment Groups Attracted

"The cold storage industry throughout the world in common with most organizations is now attracting the interest of large trading or investment groups whose activities can easily be extended to incorporate cold storage management and operation. This island appears to be following inevitably previous experience in other countries and thus this first year of the 1960's may also be the commencement of a period of considerable anxiety to many owners and operators of cold stores.

"The stage has now been reached where reduced rates and charges are at least as important to some of our customers as genuine low temperatures and efficient services. Unless one knows a method of exact comparison in costs between cold stores abroad and in this country, it is almost impossible to make an accurate assessment because the nature of the services appears to be very different and the variety of types and dimensions of stows and their rotation undoubtedly not similar to practice in this country.

"The rapid and extensive increase in new cold storage accommodation erected by processors for the cold storage of their own goods, suggests that very soon the greater part of such traffic will no longer be available to the public cold stores. Where these specialised goods were almost continuously available through the year to certain public cold stores, it would seem inevitable that only the surplus and short term items will be stored away from the producers' own cold stores.

"When one speaks of America, one also tends to think of top efficiency in cold store operation, but it is necessary to remember that all cold stores in America are not of recent construction and it is certain the majority, as in this country, are unable to make full use of mechanical handling aids. It appears to be no rumour that the cold storage industry in America is in a dangerously depressed condition and it is to be hoped all concerned in the operation of this national asset may be forewarned by these reports.

Shipbuilding

"If the fortunes of our cold storage industry appear at a low ebb what seems to be the situation in one of the largest and at present most seriously depressed of our national industries? I refer, of course, to shipping and shipbuilding and particularly as they are related to our industry because many of the larger cold storage undertakings depend upon imports from overseas for the greater part of their revenue. It is encouraging therefore to learn that there is a slight increase in the facilities for carrying refrigerated cargo both in old ships and new ships. If this increase is small it does nevertheless indicate that shipowners are confident reasonable tonnages will be on offer.

"My personal feelings are that if we can have an intelligent attitude to the problem of the Government cold stores by the Minister and also continued working together of the units of this industry then we can continue to attract sufficient business to enable us to pay our way and at the same time provide an efficient and reasonably priced service for our customers.

"I am extremely sorry so much of this report should be taken up by "cold storage" as compared to "ice" but you know I did visit the South last year to examine two new types of equipment for manufacturing respectively, block ice and flake ice. It is gratifying to learn that a flake ice machine is now in production in Aberdeen and an invitation is extended to all who may wish to visit this unit. I am sure we all wish to congratulate Mr. Knowles and Mr. Worling in trying out this new method of producing ice.

"Through the various editions of the bulletin and now with the annual report, we are right up to date with the activities of the committee of this association. With regard to visits to London by members of committee, I would like to say now to Mr. Ruddin and Mr. Lee how very much we appreciate the manner in which they look after us on these occasions and make us feel really welcome.

"We are fortunate in having Mr. Milne to represent us on the board of National Cold Stores (Management) Ltd., which company we hope will continue to operate to the benefit of our country and industry for many years to come.

"I am particularly glad to-day to have the support of our vice-president, Mr. Ferguson, who I hope will be presenting the president's report to you next year.

"Mr. Finlay has again combined humour with news in editing the bulletin and I am sure we all appreciate and enjoy his efforts. Mr. Finlay and I enjoyed every minute of the "Tenth International Congress of Refrigeration" which we attended in Copenhagen from 19th to 26th August, last year.

"Finally, but by no means least, while no special meetings have been convened with the suppliers of electricity, nevertheless, during the year under review, Mr. Walker prepared a very excellent memorandum on behalf of our members who obtain electricity from the North of Scotland

Hydro-Electric Board. This memorandum was a monumental piece of work and as usual produced in a masterly manner and for this effort and all Mr. Walker's work during the year, I thank him most sincerely.

I am also indebted to all members of committee who have assisted me so efficiently in studying the various problems which have arisen during the period 1959-60 and I do hope all our deliberations will be crowned with success.

Committee Report

The committee report, circulated to members before the meeting, considered a number of matters as follow:

Membership. Membership of the Association remained unchanged during the past year and stands at twenty-four (twenty-three firms and companies and one local authority) as at 30th April, 1960. The death during the year of Mr. Thomas Murray of Thomas Murray & Sons (Ice Merchants) Ltd., Ayr, who passed away on 21st September, 1959, is recorded with deep regret.

Finance. To meet expenditure incurred in excess of the income from annual subscriptions, the committee has resolved that levies, as under, shall be made upon members in respect of the year ended 30th April, 1960, in accordance with Bye-Law No. 3:

Storage Space	—2/3d. per 1,000 cu. ft. or part thereof. Estimated to produce	£272	5	0
Ice Sales	—1d. per ton (maximum £10). Estimated to produce	41	1	7
		£313	6	7

The estimated proceeds of the above levies, which are the same as for the previous financial year, have been taken credit for in the accounts. The income for the year, including levies as above, amounted to £524 7 7d., against expenditure of £494 8 8d. being an excess of income over expenditure of £29 18 11d. Adding the latter sum to the balance of £74 6 0d., at credit of the association as at 30th April, 1959, and deducting income tax of £5 16 3d., for the fiscal year 1959/60, there is a balance to be carried forward at credit of capital account at 30th April, 1960, of £98 8 8d.

Ice.—Sales at Aberdeen were again increased due, in some measure, to the very warm summer. At Fraserburgh, tonnage sold was on a par with 1958 but sales at Lossiemouth were well down, due to most of their vessels fishing away from home. In the Firth of Forth area the tonnage of ice sales in the early part of the year under review was well in excess of the same period of 1958 but in the last two months of 1959 and the early months of 1960 ice sales fell well below the figures of the corresponding period of previous years due to the exceptionally sustained bad weather experienced during the winter and early spring months of 1959/60.

Storage.—In the past twelve months cold storage capacity in Scotland has been more than adequate for the goods available. Subject, however, to normal seasonal fluctuations, space has been reasonably occupied. In cases where stores habitually handle specific commodities, however, some may have been adversely affected by a smaller demand for the space they offer owing to certain commodities being in short supply.

Port stores in particular can be so affected by meat supplies; for example, continued importation of Australasian meat to the United States and restrictions in Argentine supplies have created a situation in which stocks of meat in cold store at the end of March were over 40% lower than in the previous year. With high price levels and a continuance of exports to the United States there appears to be little likelihood in the immediate future of heavy imports of meat for storage.

Butter imports early in the year were steady and a good demand ensured rapid offtake. This was accompanied by a rise in prices which eventually stifled the demand. In April, cold stored stocks were several thousand tons higher than last year with little prospect of immediate distribution.

Low temperature space was in fair and increasing demand, but fish stocks were removed from store rather earlier than is normal because of the inclement weather conditions. This experience may induce customers in future to store greater quantities in the autumn to offset the higher prices they had to pay when cold stored stocks were depleted. Quick frozen produce was amply available but the tendency on the part of the larger operators is to provide their own accommodation which must always be a matter of concern to the industry.

Poultry, frozen egg and other seasonal produce made their usual demands on space and their appears little doubt that this will be repeated in the period ahead.

In the south, some stores have been operating on a basis of from 30 to 40 per cent. occupancy. The position throughout Scotland appears to be considerably better however. While some degree of satisfaction may be experienced in the relatively fortunate circumstances obtaining north of the border, this should in no way induce a state of complacency.

Sharp and quick freezing.—At Leith, quick freezing for the year under review showed a very slight improvement but the demand for sharp freezing throughout was considerably increased and thereby goods had to be distributed to other stores for cold storage. In this connection, the two companies in Leith have made considerable additions to their cold storage capacity which together should accommodate a further 1,300 tons at minus 20° Fah. in that port.

Government-owned cold stores.—Three of these cold stores, all situated in England, were disposed of by the Government during the past year following upon certain of the stores being advertised for sale as mentioned in last year's Report. All three were purchased by The Union Cold Storage Co. Ltd., with possession on 15th March, 1960.

Labour.—The rate of wages payable to storemen under the National Minimum Agreement remained unchanged during the year. Under the auspices of the Cold Storage (Wages) Panel discussions took place between representatives of the cold storage industry and of the associated trade unions in regard to questions concerning sick pay, wages of engine room staff, protective clothing and the Christmas holiday.

Electricity Tariffs.—The North of Scotland Hydro-Electric Board increased its charges for supplies of electrical energy by 5 per cent. with effect from 1st July, 1959, thus involving the cold storage and ice manufacturing companies in the area served by that Board in substantially increased costs.

Bulletin.—The practice of issuing a news bulletin following upon each meeting of the committee was continued.

General.—The Committee held meetings as and when required during the year under review for the purpose of dealing with matters affecting the interests of the members of the association. Items to which attention was directed included the following in addition to those specifically mentioned above.

Rates and charges, activities of the White Fish Authority, the Herring Industry Board and the Department of Scientific and Industrial Research, International Congress of Refrigeration, Weekly C.S.1 stock returns, Factories Act, 1959, The Institute of Refrigeration and Edinburgh Corporation —Developments at Gorgie Slaughterhouses.

The association's affiliation to The National Federation of Cold Storage and Ice Trades has been maintained and office-bearers have attended meetings of the executive council of the federation whenever this was deemed to be necessary.

Annual General Meeting

Present at the A.G.M. in the Imperial Hotel, Aberdeen were: D. Knowles (Aberdeen Ice Co. Ltd. and New Standard Cold Storage (Aberdeen) Ltd.; F. J. Worling (Aberdeen Ice Co. Ltd.); E. C. Malcolm (Aberdeen Market Co. Ltd.); T. Hamilton (Buttercup Dairy Co. Ltd.); A. Ferguson (Clyde Cold Storage Co. Ltd.); M. Lawson (Dundee Ice and Cold Storage Co. Ltd.); G. Will (Fraserburgh Ice & Cold Storage Co. Ltd.); J. H. Dunningham (Granton Ice Co. Ltd.); W. A. P. Milne (Wm. Milne Limited); R. Finlay

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(Wm. Milne Limited); J. F. McArthur (Wm. Milne Limited); G. L. Thompson (The Moray Ice & Cold Storage Co. Ltd.); J. Mackenzie (The North British Cold Storage and Ice Co.); C. Birse (Northern Co-operative Society Ltd.); J. L. Brownlie (Corporation of Paisley); D. H. Swankie (Scottish Co-operative Wholesale Society Ltd.); E. H. Stewart (Scottish Co-operative Wholesale Society Ltd.); P. D. Cowell (J. & E. Hall Ltd.); J. C. Forrest (Ministry of Agriculture, Fisheries and Food, Experimental Factory, Tory, Aberdeen); J. E. G. Ruddin (president—The National Federation of Cold Storage and Ice Trades); D. T. Lee (Secretary—The National Federation of Cold Storage and Ice Trades); R. G. Bundey (Union Cold Storage Co. Ltd.); C. A. Fearon (Union Cold Storage Co. Ltd.); Kenneth Walker (Secretary of the Association).

The Report and Accounts for the year ended 30th April, 1960, was approved and adopted unanimously on the motion of Mr. Dunningham, seconded by Mr. Lawson.

At the election of office bearers it was agreed unanimously that Mr. James Mackenzie (The North British Cold Storage & Ice Co. Ltd.) should continue in office as president of the association. It was also agreed unanimously that Mr. Alexander Ferguson (The Clyde Cold Storage Co. Ltd.) should continue in office as vice-president of the association. Mr. F. J. Worling (Aberdeen Ice Co. Ltd.) having been duly nominated, was appointed to the committee as representative of the north district in place of Mr. D. Knowles (Aberdeen Ice Co. Ltd. and New Standard Cold Storage (Aberdeen) Ltd.) who fell to retire at this time.

The Auditors of the association, Messrs. John E. Watson and Co., Chartered Accountants, Glasgow, were, on the motion of Mr. Mackenzie seconded by Mr. Lawson, unanimously re-appointed for the current year at a fee to be arranged by the committee.

On conclusion of the formal business of the meeting Mr. James C. Forrest, Head of the Engineering Section of the Ministry of Agriculture, Fisheries and Foods, Experimental Factory, Torry, Aberdeen, gave a most interesting talk entitled "Accelerated freeze-drying and its application to fish and other products."

Annual Dinner

The annual dinner of the association was held during the evening of Wednesday 15th June. "The Association" was proposed by Mr. R. G. Bundey and replied to by Mr. James Mackenzie, and the toast "the Guests" was proposed by Mr. Alex. Ferguson and replied to by Mr. J. E. G. Ruddin. "Votes of thanks" were given by Mr. Robert Finlay.

Golf Competition

The annual golf competition was played over the Banchory course during the morning of Thursday 16th June, when the principal prize-winners were as follows: 1st Class —winner, J. E. G. Ruddin, runner-up, R. G. Bundey. 2nd Class—winner, J. H. Dunningham, runner-up, F. J. Werling.

Best scratch score—W. A. P. Milne; Ladies winner—Mrs. Alex. Ferguson, runner-up, Mrs. James Mackenzie.

YORK SAVINGS CALCULATOR

AN adjustable savings calculator has been produced by York Shipley Ltd., North Circular Road, London, N.W.2, showing the economies which may be effected by installing the York model B.225 Automatic Ice Maker.

The York Ice Maker produces up to 220 lbs. of ice daily in uniform handy size pieces which are stored in an insulated stainless steel bin from where it may be drawn at any time. Block ice loses from melting, wastage, etc., at least 25 per cent. of its weight while being transported, crushed or broken up and in store. With York icelets there is no waste and as a consequence 84 lbs. of icelets is equivalent in useful cooling effect to 1 cwt. of block ice.

Largest Sign in Liverpool

The Redfern Street cold store belonging to the Union Cold Storage Company at Liverpool is located near one of the busiest junctions on the whole of the L.M.S. railway system. Nearby is an important road junction carrying north-bound traffic to and from the city. Recently the New Zealand Dairy Commission have erected what is the largest poster site in Liverpool and one of the largest in the country. The display is neonized and some idea of the size is given in the inset picture which was taken on the day that the sign was completed, when two New Zealand girls, Elizabeth and Alison Anderson from Christchurch, South Island, New Zealand, inspected the display in preparation for the "switch on." Traditionally the North prefer their butter salted and it will be interesting to see how they take to increasing supplies of the New Zealand varieties.

Sign on the Union Cold Storage Company's Liverpool premises, and an enlargement giving an indication of its size (inset).

for thorough insulation—

Polyurethane rigid foams

made from I.C.I. ISOCYANATES and POLYESTERS provide the refrigeration industry with an outstanding new material possessing excellent thermal insulating properties. Additionally they combine the advantage of great lightness with rigidity and strength. Polyurethane Rigid Foams can be made easily in a wide range of densities. The components can be conveniently mixed when and where needed and be simply poured or pumped into the desired position. The resulting foam can be relied on to withstand extreme cold and to resist heat.

Ask for details of Daltolacs 21, 22 & 24 Ⓟ and Suprasec D Ⓟ

Ⓟ Patented in main industrial countries

Enquiries should be addressed to :
I.C.I. Sales Development Department (Polyisocyanates) Ship Canal House, King Street, Manchester, 2.

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Wall's ICE CREAM

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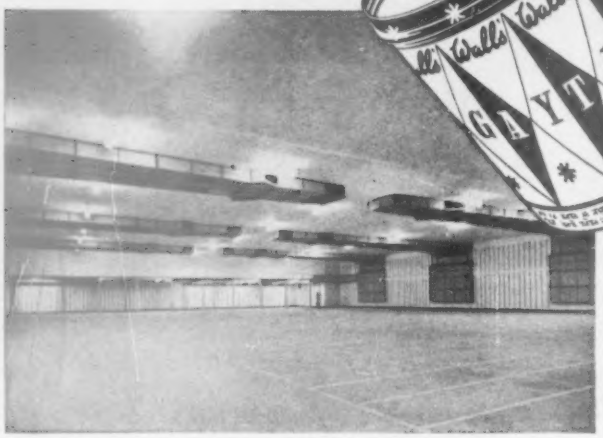
LIGHTFOOT

Refrigeration...



Photographs by courtesy of T. Wall & Son (Ice Cream) Ltd.

for their huge new factory at Gloucester which, when completed, will be the most advanced ice cream production unit in the world.

The first phase of this new project was completed when the 600,000 cu. ft. ice cream storage room, seen in our left hand illustration, was put into operation recently. This room is cooled by ducted air circulation and is served by 20 steel finned, Glycol Defrost Coolers and 6, semi-radial, Model A56 Compressors.

During sixty years of association, Lightfoot have supplied refrigeration equipment to this famous company for over 100 cold stores including the 300,000 cu. ft. room at Craigmillar, Edinburgh and the new Acton Cold Store of 430,000 cu. ft.

THE LIGHTFOOT REFRIGERATION CO. LTD. ABBEYDALE RD. WEMBLEY, MIDDX. *Tel: PERivale 3322*

LIGHTFOOT
REFRIGERATION

HIRE PURCHASE

Current Procedure and the Requirements of the Law

By our Legal Correspondent

THE relaxation of Government controls on hire-purchase transactions invites us to look once more at this kind of credit trading. There is of course nothing new about hire-purchase. It is on record that in 1840 the first suite of furniture was sold under a hire purchase agreement, and from that moment this system of trading never looked back. By the end of the 19th century there was very little that could not be bought on the hire purchase system. In 1892 the Hire Purchase Trade Association was formed.

A famous Judge once asked the question "What is a pony?" And so let us be equally innocent and ask "What is hire purchase?" It is simply a means of obtaining goods on instalment terms with the advantage of having the use of the goods during the period in which payment for them is being made. One of the essential features of hire-purchase is that the goods remain the property of the owner (the seller) until the last instalment is paid. Very many articles are obtainable on hire-purchase to-day, from furniture and radio and television receivers, domestic equipment, equipment for trade and business—such as equipment for a hairdresser's shop—motor vehicles, agricultural machinery, railway wagons, and livestock.

Acts of Parliament Governing Agreements

Hire-purchase agreements may be governed by the Hire Purchase Act, 1938 as extended by the Hire Purchase Act, 1954.

These acts are applicable to all hire purchase agreements under which the hire purchase price does not exceed (a) in an agreement relating to livestock etc., the sum of £1,000 and (b) in any other case the sum of £300.

The essential features of hire purchase transactions may be noted as follows:

Hire Purchase Price

This is the total sum payable by the hirer under the agreement in order to complete the purchase of the goods. Any sum payable by the hirer by way of deposit or other initial payment, is part of the hire-purchase price.

Cash Price

The owner must state in writing to the prospective hirer, otherwise than in the note or memorandum of the agreement, a price at which the goods may be purchased by him for cash. This requirement will, however, be deemed to have been sufficiently complied with if (a) the hirer has inspected the goods or like goods and, at the time of his inspection, tickets or labels were attached to or displayed with the goods clearly stating the cash price, either of the goods as a whole or of all the different articles or sets of articles comprised therein, or (b) the goods have been selected by reference to a catalogue which clearly stated the cash price.

Note or Memorandum

An owner cannot enforce a hire-purchase agreement unless a note or memorandum is signed by the hirer over a sixpenny stamp, and the hirer must be given or sent a copy of the agreement within seven days from the date of signing.

The note or memorandum *must* contain the following information:

(1) A statement of the Hire Purchase Price. If there are various goods comprised in the agreement, then one total hire-purchase price for all the goods is required.

(2) A statement of the Cash Price. There may be one cash price for all the various goods comprised in the agreement, but, in practice, it is advisable to itemize the cash price of the goods as far as possible.

(3) A statement of the amount of each of the instalments by which the hire purchase price is to be paid and the date or mode of determining the date upon which each instalment is payable.

(4) A list of goods sufficient to identify the goods to which the agreement relates.

(5) The Notice set out in the 1938 Act. This notice must be in statutory form. This Notice relates (a) to the rights and obligations of the hirer if he exercises his right to determine the agreement, and (b) to the restriction of the owner's right to recover the goods when such right arises under the agreement.

Rights of Owner and Hirer

Both parties have certain well defined rights. As already noted, a statutory notice must be incorporated in all hire-purchase agreements clearly stating those rights.

They relate to a number of most important matters, as, for instance, the right of the hirer to terminate the agreement and in such event to pay a specified minimum amount.

Then follow certain restrictions of the owner's right to recover goods. *Before* one-third of the hire purchase price has been paid, or tendered and any default is made by the hirer under the agreement, the owner may recover possession of the goods without first obtaining an order of the Court.

But, beware!—Yes, three times beware—*After* one-third of the hire purchase price has been paid or tendered, the owner may not enforce a right to recover possession of the goods from the hirer except by action through the County Court. If the owner enforces his right to recover possession otherwise than by action after one-third of the hire purchase price has been paid, the consequences are as follows:

(a) The hire-purchase agreement is automatically determined.

(b) The hirer is released from all liability under the agreement, and, in addition, can recover from the owner under the agreement, or under any security given by him.

(c) Any guarantor will be entitled also to recover from the owner any money paid by him to the owner under his guarantee or any security to that guarantee.

But certain duties and obligations also rest upon the hirer. He may terminate the agreement at any time before the final payment falls due giving notice and paying all due instalments, *and a sum sufficient to bring the total payments up to one-half of the hire-purchase price.* It will be appreciated that no one could reasonably be expected to let out goods on the hire-purchase system, if the hirer could pay, say, only one or two instalments, and then determine the agreement and return the goods. Among other matters, the depreciation in the goods might be greater than the amount paid for them before their return. Therefore the above mentioned extra payment (i.e. to bring the total payments up to one-half of the hire-purchase price) is intended to compensate the owner for depreciation of the goods.

The hirer is under a duty to keep the goods comprised in the agreement in his possession or control. He is obliged, on receipt of a request in writing from the owner, to inform the owner where the goods are situated.

The hirer must not fraudulently convert the goods to his own use or to the use of any person other than the owner (Section 1 of the Larceny Act, 1916). In plain language this means that if the hirer, during the currency of the hire-purchase agreement, sells the goods then he will be guilty of larceny. If the hirer merely pledges the goods with the intention of redeeming them and restoring them one day to the owner, then the hirer may not be guilty of the criminal offence of larceny. But any hirer who behaves in such a way would receive little, if any, consideration from the Court when he is ultimately sued by the owner for the return of the goods and damages for their conversion.

CORRESPONDENCE

Alloy Freezing Plate Efficiency

Sir,—It was with interest that we read the correspondence in your June issue concerning freezing plates and we would like to add a few remarks on this subject.

What Mr. Lawrence wrote is, in part, quite true, but whilst it is correct to say that the greater the amount of refrigerant being passed calls for a suitably rated compressor, this is no valid argument for restricting the quantity of refrigerant through a system. In any undertaking, there is a point where substantial increases in production justify a higher level of both capital outlay and total operating costs and this factor is equally true of plate freezing. Furthermore, where it can be established also that freezing plates are capable of operating as near as possible to the efficiency of the compressor itself, then the very fact of lower unit cost of thermal extraction becomes a most important feature. Allied to substantial increases in production it must of course represent really economic operating.

We ourselves have developed a primary surface plate, the outcome of considerable research, which is now being used in a 14-station freezer of our own manufacture.

Such plates have an efficiency index comparable to that of the compressor and result in quicker freezing, with consequent greater production throughout. Therefore any increased cost of the refrigeration plant is more than compensated for.

Yours etc.,

London, S.W.4. A. JONES,
July 7, 1960. Warrington Tube Co. Ltd.

PRESTCOLD CHIEFS' N. AMERICAN VISIT

Mr. J. B. Marsh and Mr. F. Moore—the two executives in charge of the export and publicity departments at Prestcold, have recently returned from a fortnight's tour of America and Canada. Purpose of their trip—which took in Chicago, Montreal and New York—was to study market conditions.

CHANGE OF ADDRESS

Mr. H. C. Timewell, general manager of the Domestic Appliance Division of the English Electric Co., Ltd. and his staff at Queens House, Kingsway, London, W.C.2, have moved to Marconi House, Strand, London, W.C.2, tel.: COVent Garden 1234.

"Ample Room for Sales Expansion"

—DORDEC Chairman

GROWING awareness of the necessity for hygiene in the preservation of foodstuffs and a housewife much more discerning and selective in her choice, coupled with new developments, will ensure a continued rise in the demand for commercial refrigeration in the next decade. These are the closing comments of Mr. E. G. Rowledge, senior director of Prestcold and chairman of the Domestic Refrigeration Development Committee, in an article entitled "Ample room for refrigerator sales to develop" in *The Financial Times Annual Review*, 1960.

In the course of the article Mr. Rowledge says:

The domestic refrigerator industry has been in existence in this country for over thirty years but until recently it has been somewhat slow to develop; indeed, until two years ago it was considered by those engaged in it to be a depressed industry. Before the war the volume of business was small and a high proportion of the cabinets sold were either wholly, or in part, imported, generally from the United States.

Following the war, and stimulated by the Government's decision to fit refrigerators into prefabricated houses, renewed interest developed and a number of major companies built and equipped modern factories to produce refrigerators in greater quantities and at lower cost to meet the expected increased demand. Progress, however, was still slow. The product was looked upon by public, Press and Government alike as a luxury appliance and the latter saddled the industry with export quotas, a crippling rate of purchase tax and severe hire-purchase restrictions.

Household Word

Two years ago the picture started to change and to-day refrigeration is generally accepted by the British public as a household word, in short, a domestic refrigerator is becoming a "must" in the modern home.

In the 1958 Budget (as a direct result, the Committee believes, of presentations from DoRDec), the 60 per cent. rate purchase tax was reduced to 30 per cent. and in October of that year all hire-purchase restrictions were removed. Again, in the 1959 Budget, purchase tax was further reduced to 25 per cent. and a spectacular increase in sales resulted. From the industry's "high" of 256,500 in 1957 sales grew to 448,500 in 1958 and to 849,363 in 1959. In addition, in 1959 there were imports from Western Europe of some 124,000 refrigerators.

The market for household refrigerators is a highly competitive one and competition is especially keen from Western Europe, where manufacturers have not been burdened with such heavy restrictions as have British manufacturers and in consequence have developed more rapidly.

While it would be unrealistic to expect the industry's sales curve to continue to rise in the manner of the last two years, the prospects for an increasing demand in the next few years are good, for at the end of 1959 only some 17½ per cent of the 16m. homes in the country had a household refrigerator. The British refrigerator industry is in an excellent position to cope with the anticipated increase.

M. L. WINSOR SALES COMPETITION

At the beginning of this year M. L. Winsor & Co. Ltd. instituted a salesmen's Competition amongst the distributors of IWO FRYS refrigeration equipment for the largest number of machines installed during the period January 1 to June 30 1960. The results of this competition have now been announced. Winners of the first, second and third prizes, respectively, were: Mr. F. W. Stanley, Stanley Refrigeration Ltd., 173-174, High Street, Deritend, Birmingham 12 (24 machines); Mr. G. Douglas, Crowther & Shaw Ltd., Cloth Hall Corner, Huddersfield (17 machines); Mr. L. F. Newman, H. J. & A. Wright Ltd., 100-106 High Street, Gt. Missenden, Bucks (16 machines).

Prizes of £25, £15, and £10 have been awarded to the above three winners. A second competition commencing July 1 and ending on the December 31 1960 has started, and will be based on the largest turnover as against the largest number of machines of the previous competition.

LEVIN U.K. OFFICE

Coinciding with the inauguration of the European Free Trade Association, K. J. Levin, of Sweden, have opened a United Kingdom office. The company, LEVIN, which entered the British market three years ago, distribute their wide range through 18 main agents in Great Britain and Northern Ireland.

Their new offices, 20 Beauchamp Place, London, S.W.3 (telephone KNIghtsbridge 5973), will be organized by their newly appointed English sales manager, Mr. H. L. Bennett.

The Cambridge Instrument Co. Ltd. announces that its Nottingham Office has been moved and is now at Century Insurance Building, Milton Street, Nottingham. (Telephone : 42612).

BUYERS' GUIDE

APPLIED GLACIOLOGY

M.I.T. Designs Ice Alloys for Building Large Structures

A NEW science—"applied glaciology"—has been developed in the Ice Research Laboratory of the Massachusetts Institute of Technology. As described by Professor W. David Kingery, head of the laboratory, the research started in an effort to put to work "the most plentiful and so far the least useful" substances on earth—ice and snow. It is aimed towards developing practical methods for using ice and snow as inexpensive large-scale building materials in Arctic and Antarctic regions.

One of the earliest experiments was to find out why ice cubes stick together in water but not in whisky and it is believed that alcohol-ice mixtures may provide a successful answer to the problem.

Dr. Kingery says that the laboratory is already finding ways—including the addition of alcohol and other substances—to improve processing methods and to make stronger and more useful ice. (Alcohol aid in processing by lubricating ice grains so that they fit together better.) He predicted that engineers would be building practical structures out of ice in two to three years as a result of advancing research in this field.

"The basis for new studies," he said, "is that ten per cent. of the earth's surface is covered by ice and snow. The snow-covered areas and the oceans are the two great terrestrial frontiers which have not been fully explored; in some minds they offer much more hope for exploitation than does outer space. But development of the earth's cold region can only be achieved when the local environment, including ice and snow, is positively used rather than passively fought."

The need for research lies in the fact that ice and snow as found in nature seldom have the properties required for modern construction, Professor Kingery said.

"Ice and snow have been used as construction materials by residents of cold climates for a long time," he said. "Applications have included snow houses, ice logging roads and ice bridges, ice storage areas in logging operations and others. In all these, however, the requirements as to structural properties are not stringent and the applications have been limited to the use of natural, unimproved material. Extensive progress has also been made in excavation of tunnels and rooms in glacial ice and snow. But the opportunities and usefulness for this kind of construction are obviously limited."

In general, he said, good use has been made of ice and snow in its natural state. But he called it a "stone age" activity because no processing methods have been developed to a point where widely useful construction and fabrication techniques are available for on-the-spot building.

Studies of ice "alloys," which now appear to be one of the most promising avenues of research, have been limited. The only serious consideration given the problem was the development of ice-saw-dust mixtures during World War II in connexion with British plans to build a 2-million-ton aircraft carrier out of ice. The addition of about 15 per cent. saw-dust, it was found, more than tripled the tensile strength of the ice.

Other and important alloys developed by Professor Kingery are ice-glass fibre mixtures. Ice which contains as little as four volume per cent. glass fibre is ten times stronger than pure ice. Natural ice has a tensile strength of 200 pounds per square inch, whereas one ice-glass fibre alloy has a tensile strength of 2,000 pounds per square inch.

Because of the low strengths of natural ice and snow, massive structures are now necessary in order to be useful. For example, as a landing platform for modern aircraft, thicknesses of 50 inches of fresh ice and up to 74 inches of sea ice are recommended in some cases as necessary for "safe" operations. Development of new ice alloys substantially decreases these thicknesses.

Development of new processing methods—including solidification techniques, mining and communition (pulverizing) of natural ice and snow, incorporation of strengthening agents, and new construction methods—should make practical the building of large structures. It is as a potential processing aid that alcohol and other lubricating agents, which will help ice grains fit together in a dense structure, are being studied.

Facilities of the new M.I.T. laboratory include a refrigerated test chamber in which temperatures can be maintained down to 40 degrees below zero. Two rooms have separate temperature adjustment, and the laboratory has instruments for measuring ice strength and solidification characteristics and for studying stresses in ice structures.

NEW FACTORY FOR ALPINE

Alpine Crown Corks Ltd., and its subsidiaries Alpine Insulations Ltd. and Cork Supplies Ltd. have occupied a new factory at Alpine Works, Newton Road, Crawley, Sussex (telephone: Crawley 26326).

United Air Coil Limited have moved to new premises at 14 Trinity Street, London, S.E.1 (telephone: HOP 7421/4).

With Special Reference to the

Bulletin of the International Institute of Refrigeration, No. 2 1960

Reviewed by DR. EZER GRIFFITHS, *Hon. President of the I.I.F.*

The first meeting of the Working Party on "Frozen Foods" is reported extensively in this issue. Representatives from ten countries attended this gathering in March in Karlsruhe, and topics discussed included definitions of time of freezing, rate of freezing, and the effect of the latter on the quality of frozen products.

Air conditioning and dust extraction in the chemical, textile, cardboard and paper industries was the subject of a meeting held at Rouen in June, details of which are given, and an interesting contribution to this issue is an address given by Prof. Gorter on the work of Kamerlingh Onnes, with particular reference to his discovery of a helium liquifying process in 1908. Also of interest is an account of progress in research in the field of refrigeration in various countries.

At the Technischen Hochschule, Karlsruhe, research is in progress on: (a) Heat transfer—which embraces such topics as heat transfer and pressure drop through tube-bundles, in annuli with longitudinal fins, and boiling heat transfer problems; (b) thermodynamic properties of gases, liquids, powders and mixtures, which covers the construction of Mollier diagrams and heat transfer in evacuated powders. (c) Refrigeration, concentration of acqueous solutions by freezing.

The Danish Meat Research Institute is working on problems in connection with the speed of the chilling of carcases and the use of aluminium foil for packaging frozen foods, and at the Stazione Chimico-Agraria Sperimentale di, Torino, Italy work is in progress on the physiological deterioration of certain varieties of apples due to cold. Both these projects are reported.

Tests are being made on antibiotics for the disinfection of cold stored products, particularly pears, apples and grapes, at the University of California, Dept. of Food Science and Technology. They are directed to the study of yeasts and molds responsible for the spoiling of foods, dehydration, the chemistry of flavour.

The College of Engineering, Wisconsin, is conducting research on problems of solar cooling, including intermittent absorption cycles for coolers, and the Market Quality Research Division, Washington, gives an extended list of topics including one on the control of apple scald by diphenylamine. The complete list of topics takes up more than four pages of the Bulletin.

ABSTRACTS

A wide variety of subjects is covered in the abstract section. One of these abstracts deals with thermistors for the range 10 to 600°K, and another with psychrometric charts, past and present. Condensation between the panes of double windows is also dealt with.

A paper from the U.S.S.R. which is abstracted in this section considers a new method for determining enthalpy and entropy of refrigerants, and under a main heading "heat transmission" there are a number of accounts dealing with conductivity.

There are several abstracts of papers published in Japan. Three of them deal with heat transfer from a vertical surface, and two discuss refrigerant flow through capillary tubes.

The properties of the fluorinated hydrocarbon refrigerants are the subject matter of one of the papers abstracted and the physical properties are presented in tables. Another discusses why refrigerant 22 should be favoured for absorption refrigeration.

Other abstracts in this section deal with: molecular sieves; experimental research on lubrication of refrigerant-12 systems and some of the problems involved; digital computers applied to compressor design analysis; thermoelectric refrigeration; theoretical analysis and performance characteristics of a Peltier refrigerator; control of refrigerator noise; refrigeration in aeronautics; ground freezing for shaft sinking; use of polythene pipes for well-boring by means of freezing; design and cost data for ice rinks; contemporary Scandinavian open-air rinks; apple storage improved by cold atmosphere systems; the problem of volatiles in scald as observed with apples in cold storage; effects of certain pesticides on the flavour of frozen strawberries; the cooling of milk; chilling and storage of fish on refrigerated trawlers; changes in the lipids of cod during storage in ice; standard for speed-governed transport refrigeration units employing forced-circulation air coolers; standard for centrifugal liquid-chilling packages.

A number of publications are reviewed in this issue of the bulletin including: A supplement to "Helium"; Handbook of Milk-dairy Construction and Engineering; Handbook of World Literature on Dairying, containing more than 3,500 references. A list is given of recent publications by the Institute.

HOLLOW PLASTIC FANS

SOLE rights to manufacture "Marex" hollow plastic fans in the U.K. have been acquired by Marston Excelsior Ltd., an I.C.I. subsidiary. The fans are made in America by the Hudson Manufacturing Co., of Houston, Texas. Initially, the standard range will consist of 4-bladed fans ranging from 5 to 14 ft. (1,830 to 4,270 mm.) diameter in increments of two ft. (610 mm.) diameter.

A set of hollow plastic blades may be fitted to two types of hub, either the auto-variable hub, which by means of a pneumatically activated diaphragm alters the angle of pitch while the fan is in motion, or the adjustable pitch hub, which requires that the fan be stopped while a simple manual alteration of pitch is carried out. On both hubs the angle of pitch may be varied between −15° and +30°.

COLD LOGIC

When the problem is the lowering of temperature, it's a matter of cold logic to use 'Arcton' chlorofluorohydrocarbon refrigerants from I.C.I. — the first to introduce this type of refrigerant in Great Britain. (And the people with the greatest experience.)

Not that I.C.I. is resting on its laurels. Behind 'Arcton' refrigerants there's a background of constant research for further improvements. Wherever cooling is the problem, 'Arcton' refrigerants can provide the answer. They're of consistent high quality and low moisture content: and they're non-toxic, non-corrosive and non-inflammable. What's more, there's an 'Arcton' refrigerant to suit your need.

ARCTON REFRIGERANTS

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1

ICI

With Special Reference to the

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There are several abstracts of papers published in Japan. Three of them deal with heat transfer from a vertical surface, and two discuss refrigerant flow through capillary tubes.

The properties of the fluorinated hydrocarbon refrigerants are the subject matter of one of the papers abstracted and the physical properties are presented in tables. Another discusses why refrigerant 22 should be favoured for absorption refrigeration.

Other abstracts in this section deal with: molecular sieves; experimental research on lubrication of refrigerant-12 systems and some of the problems involved; digital computers applied to compressor design analysis; thermoelectric refrigeration; theoretical analysis and performance characteristics of a Peltier refrigerator; control of refrigerator noise; refrigeration in aeronautics; ground freezing for shaft sinking; use of polythene pipes for well-boring by means of freezing; design and cost data for ice rinks; contemporary Scandinavian open-air rinks; apple storage improved by cold atmosphere systems; the problem of volatiles in scald as observed with apples in cold storage; effects of certain pesticides on the flavour of frozen strawberries; the cooling of milk; chilling and storage of fish on refrigerated trawlers; changes in the lipids of cod during storage in ice; standard for speed-governed transport refrigeration units employing forced-circulation air coolers; standard for centrifugal liquid-chilling packages.

A number of publications are reviewed in this issue of the bulletin including: A supplement to "Helium"; Handbook of Milk-dairy Construction and Engineering; Handbook of World Literature on Dairying, containing more than 3,500 references. A list is given of recent publications by the Institute.

HOLLOW PLASTIC FANS

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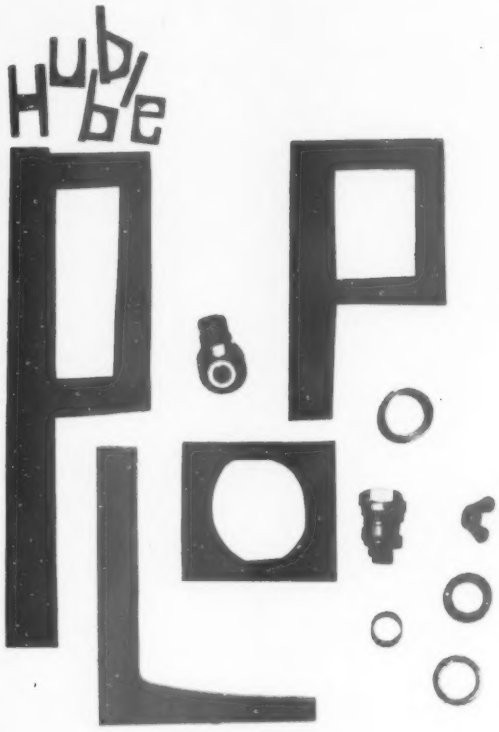

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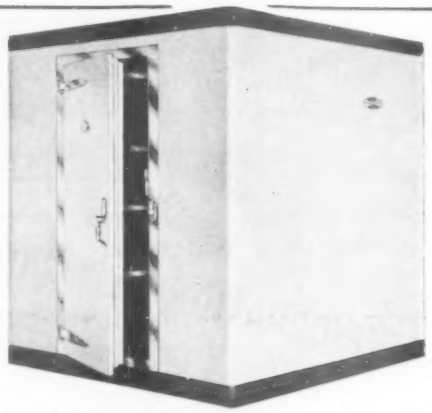

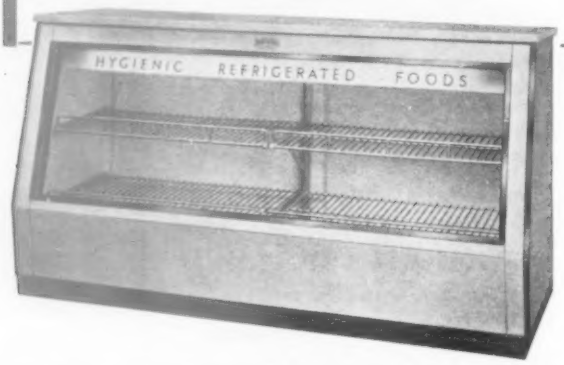

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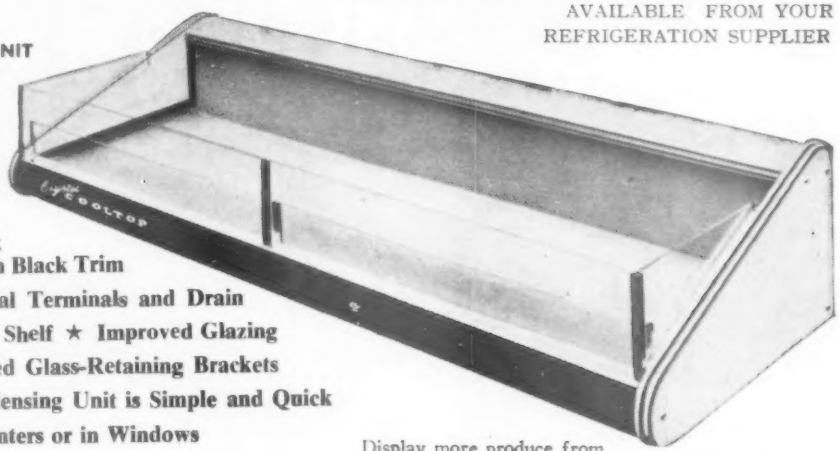

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